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JOB PERFORMANCE REPORT

State of:___Idaho___ Name: RIVER AND STREAM INVESTIGATIONS
Project No.: F_73=R_6 Title: Henrys Fork Fisheries Investiga-
Subproject No.: IV tions -----
Study No.: -----III___
Job No.: 1
Period Covered: March 11, 1983 - February 28, 1984

ABSTRACT

An extensive survey of fish population abundance, species composition, and age and growth was conducted using electrofishing and snorkel census techniques in Robinson Creek, Warm River, Falls River, Buffalo River and their tributaries. Trout were also tagged for migration studies.

Brook trout were the most abundant salmonid species and were found in all waters except above impassable falls in Robinson and Wyoming creeks. Rainbow trout, rainbow x cutthroat hybrids, cutthroat, and brown trout were also collected. Population estimates of age I+ and older trout ranged from 3/km in Boone Creek to 5,057/km in Buffalo River, with estimates at most transacts ranging from 200-500 fish/km. Only 2.3% of the tags placed on trout in Henrys Fork tributaries were returned by anglers in 1983, and only one fish had moved from the location of tagging.

The oldest fish sampled were age V+ rainbow trout and age IV+ brook trout. Few fish exceeded age III+. Growth of trout was quite variable between streams, but was consistently slower than growth of trout from the Henrys Fork. Best growth was exhibited by brown trout stocked as fry in 1981 and 1982 in Warm River and Robinson Creek drainages. Estimates of annual survival of trout were generally very Low, ranging from 6% to 52% for brook and rainbow trout. Because brook trout populations show slow growth and low annual survival, yield to anglers should be increased by a brook trout bonus limit for all Henrys Fork tributaries.

Several natural and man-made barriers to fish migration exist within the study area. Of special interest is an impassable waterfall on Robinson Creek, above which an isolated population of cutthroat trout exists without threat of hybridization with rainbow trout, or of competition with brook trout.

Forest Service General Aquatic Wildlife Survey (GAWS) and Region 1 (RI) habitat survey data and spawning and pool habitat survey maps are

Included and discussed. GAWS and R1 data were generally poor predictors of fish abundance and biomass. Spawning and pool habitat were generally classified as fair to very good, and no streams were classified as very poor habitat.

Authors:

Robert Spateholts
Fishery Technician

Virgil Moore
Regional Fishery Manager

INTRODUCTION

The Henrys Fork (North Fork) of the Snake River in eastern Idaho (Fig. 1) supports a major fishery. The Henrys Fork Investigations research project was initiated in 1976 to assess fish population abundance, angler use, fish harvest, and the effects of various regulations on the fishery. The tributary study was initiated in 1983 to assess fish populations, angler use, fish harvest, and to obtain baseline data for development of a management plan for major tributaries (Buffalo River, Warm River, Robinson Creek, and Falls River) between Island Park Dam and St. Anthony, Idaho. The major goal in 1983 was to conduct an extensive inventory of the status of fish populations in Henrys Fork tributaries.

OBJECTIVES

To determine presence and abundance of salmonids in the Falls River, Warm River, and Robinson Creek drainages.

To mark or tag adult and juvenile fish to determine movement patterns.

To determine spawning and rearing potential of the Buffalo River.

To evaluate age and growth of salmonids.

To document use of all tributaries by spawning salmonids from the Henrys Fork.

RECOMMENDATIONS

Conduct quantitative creel census to determine angler effort and harvest in Henrys Fork tributaries.

Determine the need for regulations to protect native cutthroat trout in Robinson Creek and Falls River drainages.

Extend the bonus brook trout limit to all Henrys Fork tributaries.

STUDY AREA

The Henrys Fork Basin above Falls River has a total drainage area of 2,770 km², and the Falls River drains an additional 844 km². Altitude ranges from 1,600 m on the Snake River Plain to over 3,000 m at the Continental Divide, and mean annual precipitation is about 90 cm. Most of the drainage is on federal lands, and primary land uses include recreation and forestry. On the Snake River Plain, the primary land use is

agriculture. Geologic formations in the drainage are primarily volcanic in origin, including the Plateau and Yellowstone rhyolitic formations and the basaltic Island Park caldera (Whitehead 1978).

Numerous springs emerge at the base of bluffs of the Plateau's rhyolite formation and constitute most of the flow in Big Springs Creek (Henrys Fork above Henrys Lake Outlet), Buffalo River, and Warm River. The combined flow of springs from this formation is over 1,300 m³/sec, which is more than 40% of the annual discharge of the Henrys Fork above Falls River. The springs range in discharge from less than 1 m³/sec (Ashton Hot Springs) to 446 m³/sec (Big Springs). Warm River Springs has a discharge of 437 m³/sec at a constant temperature of 11 C, pH of 7.2, and specific conductance of 125 micromhos (Whitehead 1978).

Four major tributary systems were surveyed in 1983 (Fig. 1]. Buffalo River has a drainage area of 153 km², mean annual discharge of 5.1 m³/sec, and peak discharge of 14.4 m³/sec. Warm River has a drainage area of 375 km², mean annual discharge of 6.0 m³/sec, and peak discharge of 25.6 m³/sec. Robinson Creek drains 326 km² and has a mean discharge of 3.4 m³/sec (peak discharge 34.2 m³/sec). Falls River drains 844 km² with mean annual discharge of 22.0 m³/sec (Whitehead 1978).

Conductivity of Henrys Fork tributaries ranges from 40–140 micromhos, which is on the low end of the normal range of values for fresh waters (50–1,000 micromhos). The pH values range from 7.5–8.0, which are nearly optimal for aquatic life, and midsummer water temperatures are suitable for trout survival. Chemical analyses of water samples from several springs and streams within the study area can be found in Whitehead (1978).

TECHNIQUES USED

Study Site Selection

Study sites were chosen to represent typical habitat in all streams surveyed, from small headwater streams to the mainstem of the major tributaries. On the larger streams, we had more than one transect, and they varied in length (60–650 m) to include pool and riffle habitat types. Transects on Warm River, Fish Creek, Porcupine Creek, Conant Creek, and Boone Creek corresponded to stations evaluated by Smith (1981, 1982) with the GAWS (General Aquatic Wildlife Survey) habitat survey method.

With the exception of Little Robinson Creek in Yellowstone National Park, all transects were located within 0.5 km of roads. Many of the roads are gated by the Forest Service and not accessible to the general public. Much of Warm River, Robinson Creek, Falls River, Conant, and Squirrel creeks are in steep canyons and are relatively inaccessible. We were able to sample Warm River and Robinson Creek by snorkeling, but poor

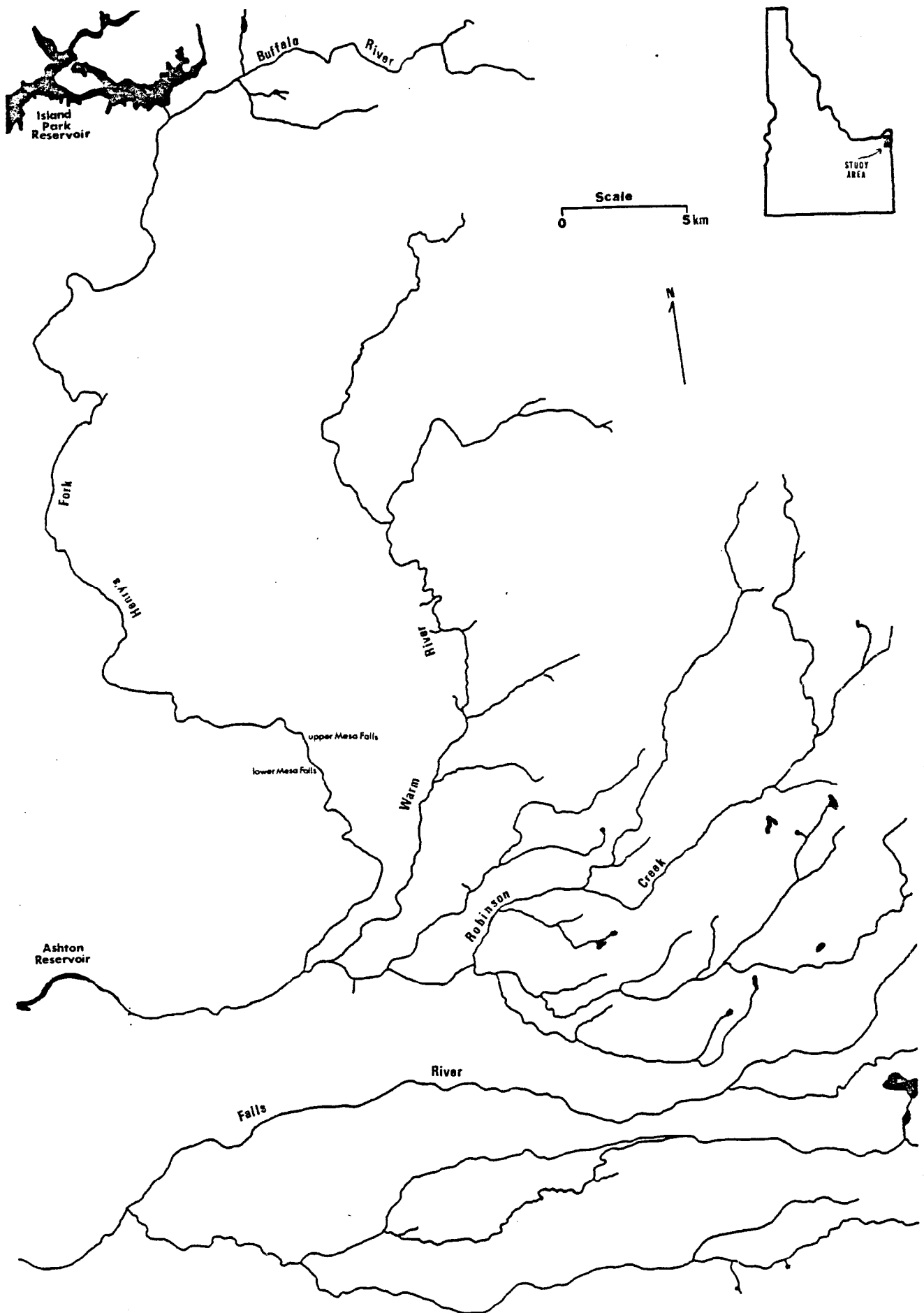


Figure 1. Map of Henrys Fork of the Snake River from Island Park Reservoir to Ashton Reservoir showing tributary drainages surveyed in 1983.

visibility in the other waters prevented us from obtaining fish population data by this method. Electrofishing and snorkel transacts for Robinson Creek and tributaries are shown in Figure 2, for Warm River and tributaries in Figure 3, for Falls River and tributaries in Figure 4, and for Buffalo River and tributaries in Figure 5.

Sampling Techniques

Electrofishing was used to capture fish for population estimates, tagging, and age-growth studies. We used a DC shocker mounted in a drift boat to shock in Lower Warm River on June 20. Low conductivity forced us to use continuous direct current. All other electrofishing was done with pulsed DC backpack shockers.

Shocked trout were anesthetized with MS-222, measured to the nearest millimeter, and weighed to the nearest gram. Trout larger than 200 mm were tagged with individually numbered monel jaw tags, and smaller trout were given fin clips for future recognition (Appendix A for a list of fin clips]. Scale samples were taken from a representative sample of trout from each water for age and growth studies. Total Lengths were recorded for representative samples of whitefish, sculpin, suckers, shiners, and dace.

Trout Population Estimates - Electrofishing

Several techniques were used to estimate fish abundance in the various waters, depending on size of the stream, water clarity, and efficiency of electrofishing. On small streams (less than 10 m wide with pools less than 1 m deep] repetitive passes were made through a transect to obtain depletion population estimates. Natural barriers such as shallow riffles, waterfalls, or beaver dams were used as the upstream and downstream ends of our transects. We assumed that no fish migrated into or out of the transact during the sampling period. Shocking started at the downstream end of the transact and proceeded upstream. Trout were netted quantitatively, and representative samples of other species were taken. At the end of the first run, we processed the fish and either released them downstream from the transact or held them in buckets.

A second pass through the transect was made. If fewer than 50% of the number of trout sampled on the first run were captured on the second run, the population was considered adequately depleted. For transacts sampled with two passes, the formula of Saber and LeCren (1967) was used as follows:

$$N = \frac{(V_1)^2}{(V_1 - V_2)}$$

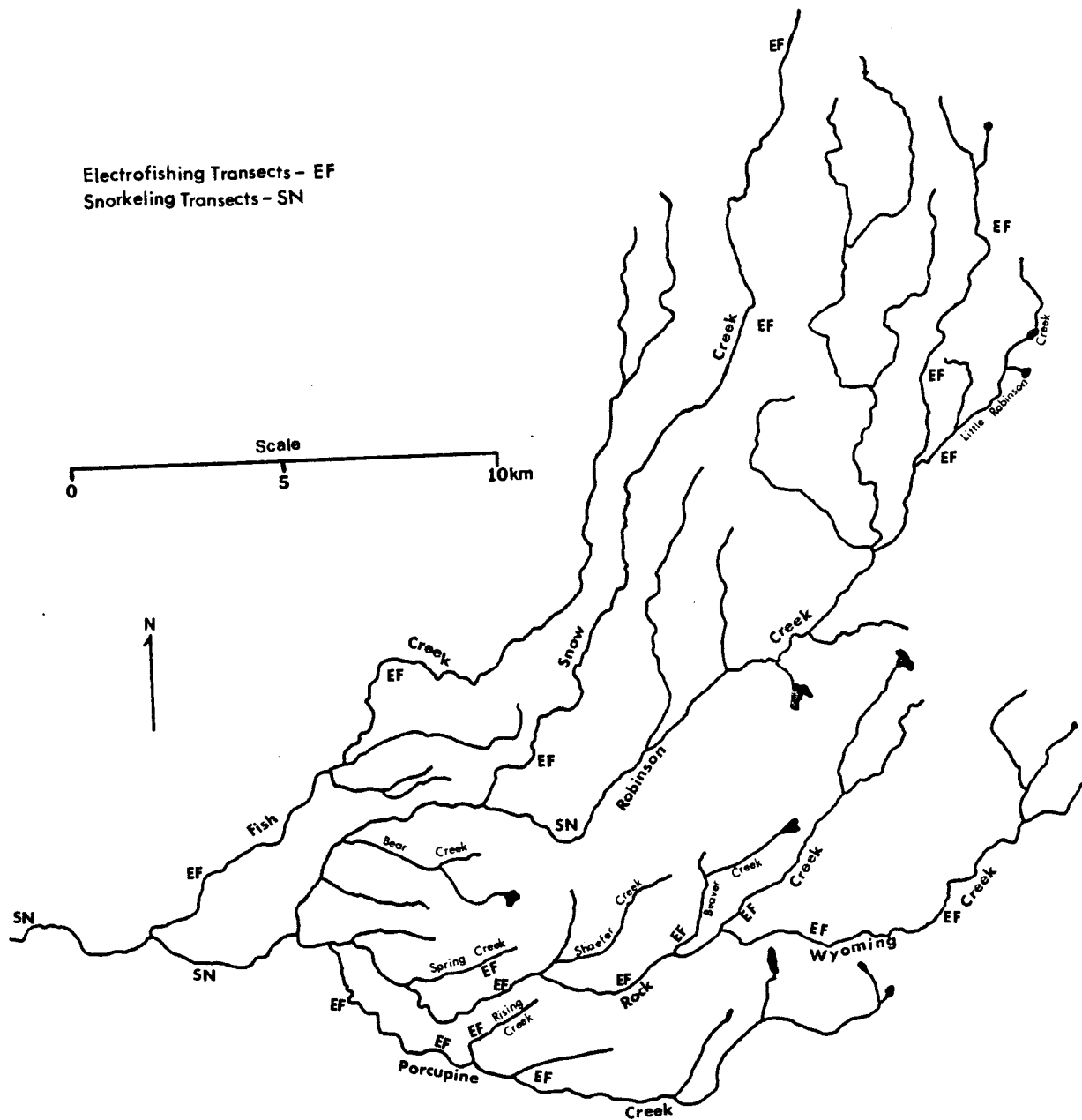


Figure 2. Locations of electrofishing and snorkel transects in Robinson Creek and tributaries, 1983.

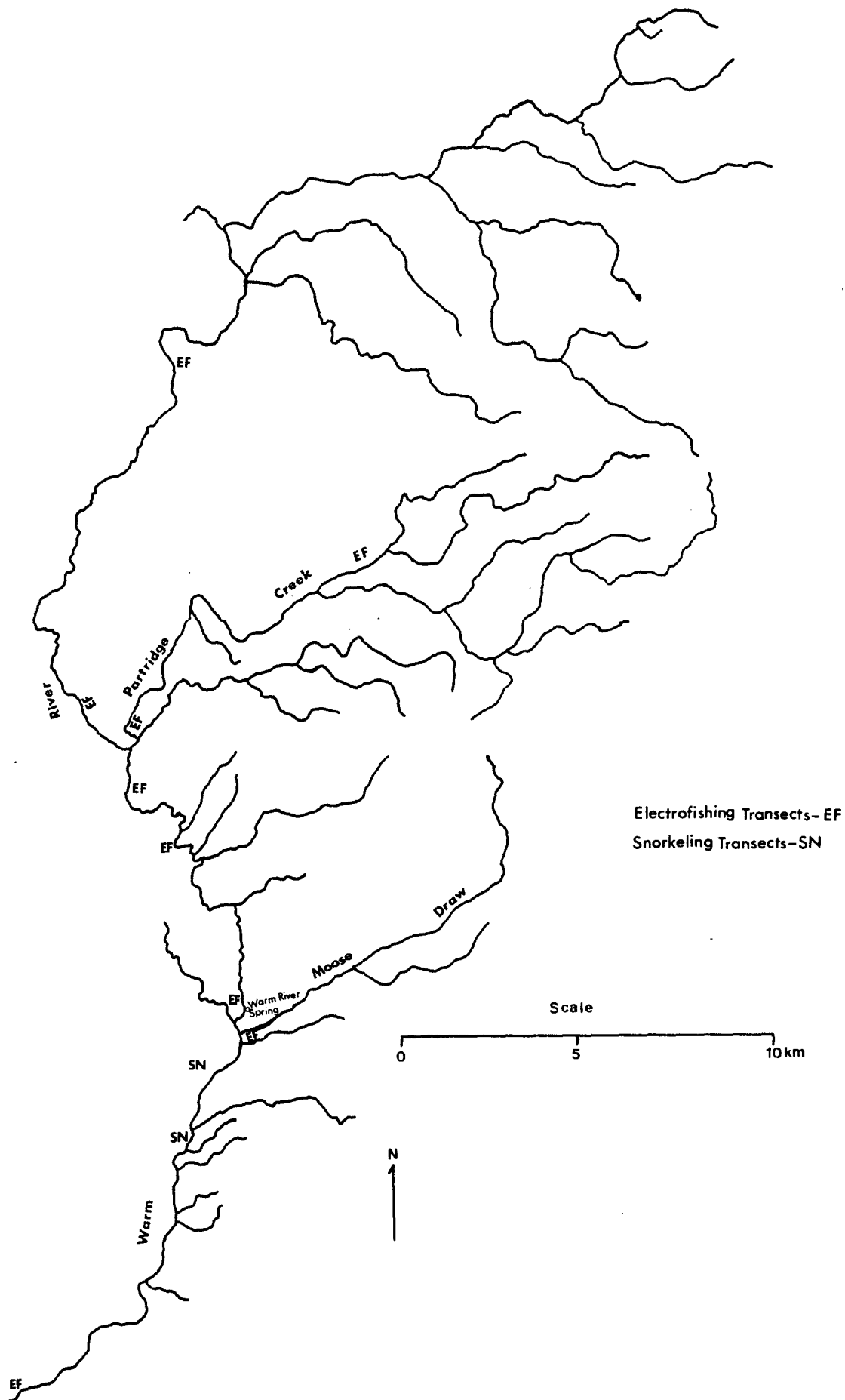


Figure 3. Locations of electrofishing and snorkel transects on Warm River and tributaries, 1983.

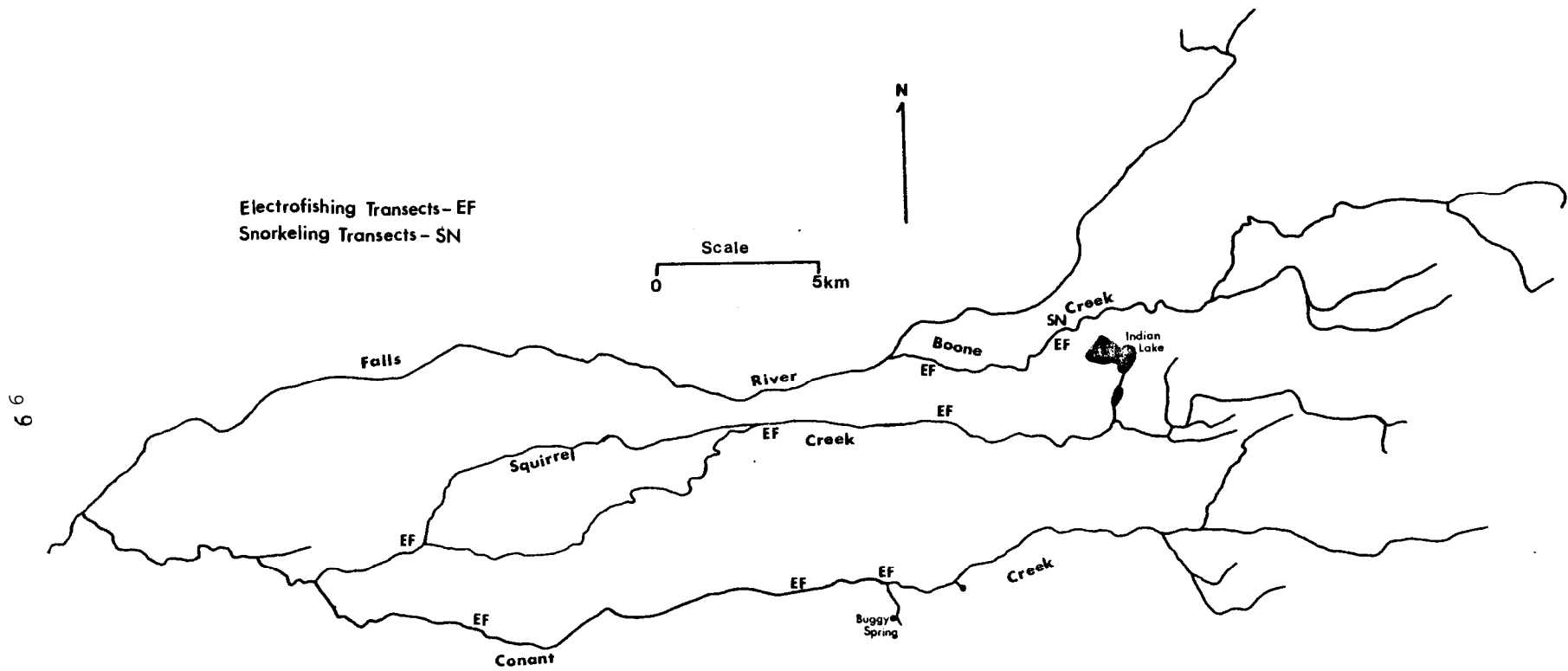


Figure 4. Locations of electrofishing and snorkel transects on Falls River and tributaries, 1983.

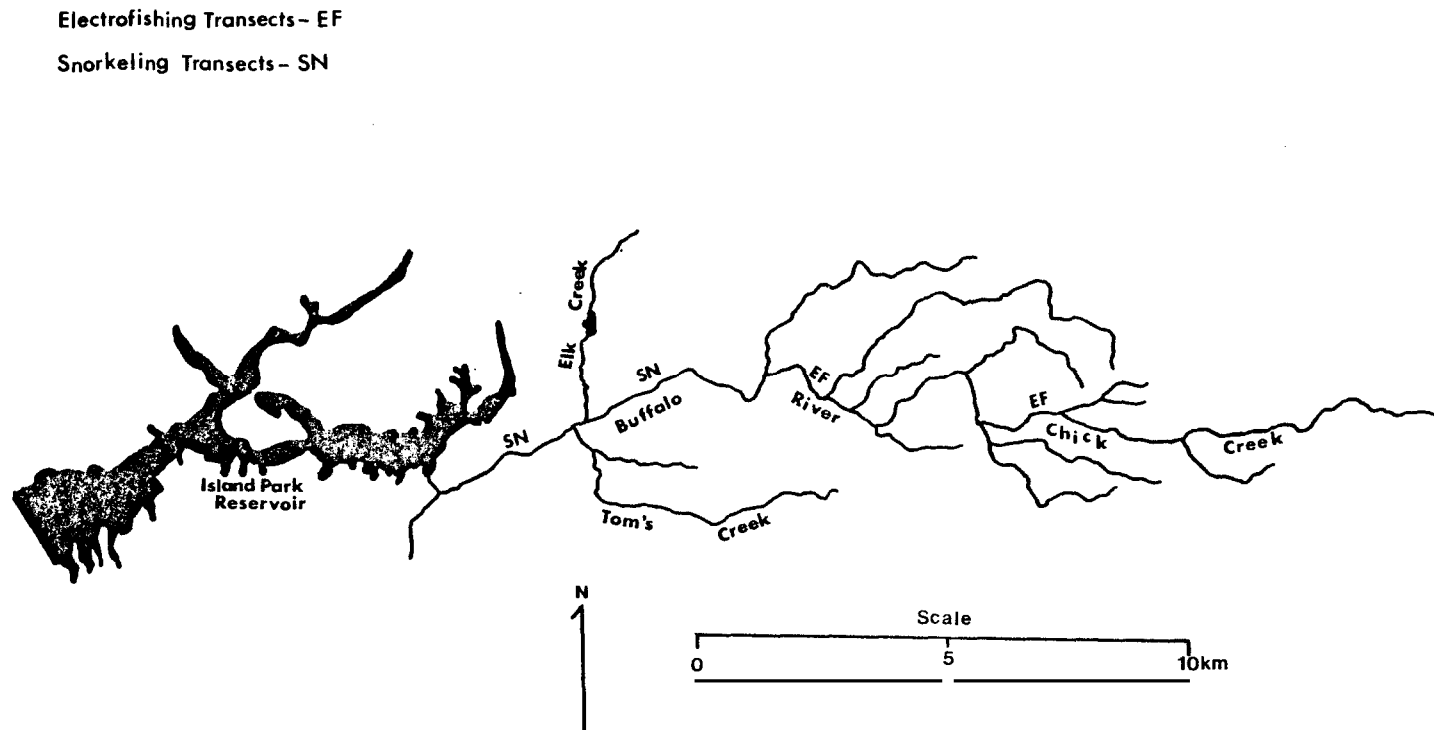


Figure 5. Locations of electrofishing and snorkeling transects on Buffalo River and tributaries, 1983.

Where: \hat{N} = fish population estimate
 V_1 = the number of fish collected on the first pass
 V_2 = the number of fish collected on the second pass

$$\text{and } SE(\hat{N}) = \frac{\sqrt{[V_1]^2 \times [V_2]^2 \times T}}{(V_1 - V_2)^4}$$

Where: $SE(\hat{N})$ = the standard error of the population estimate
 T = the total number of fish collected ($V_1 + V_2$)

If more than 50% of the number of trout sampled on the first run were captured on the second run, a third run was made through the transect. It was occasionally necessary to do a fourth pass if more than 50% of the number of trout captured on the second pass were caught on the third run. The Zippin (1958) method was used to estimate populations sampled with three or four removals using a maximum likelihood estimator,

$$R = \frac{\sum_{i=1}^k (i-1)V_i}{T} \quad \text{as described by Platts et al. (1983).}$$

On larger streams (10-15 m wide with pools >1 m deep) mark-recapture estimators were used due to inability to capture sufficient fish for depletion estimators. All trout were marked with tags or fin clips and returned to the transect. After 1 to 11 days, a recapture run was made. Trout were examined for previous marks. New fish were marked for identification in future studies. Areas above and below our marking transect were shocked to determine if fish had moved upstream or downstream since the marking sample. If no movement was detected (no marked fish captured above or below marking transect), only fish sampled in the original transect were used for the population estimate. If movement did occur, the upstream and downstream samples were included in our population estimate. A modified Peterson mark-and-recapture formula (Ricker 1975) was used to estimate fish populations as follows:

$$\hat{N} = \frac{(M+1)(C+1)}{(R+1)}$$

Where: \hat{N} = the population estimate
 M = number of fish marked
 C = number of fish in the recapture sample
 R = number of marked fish in the recapture sample

with a standard error ($SE(\hat{N})$) of:

$$SE(\hat{N}) = \frac{\sqrt{(\hat{N}^2)(C-R)}}{(C+1)(R+2)}$$

A multiple mark recapture technique (Schnabel 1938) was used to estimate the trout population in Rock Creek below Road 490 using angling on 12 July to mark and electrofishing to obtain recapture samples on 13 and 14 July. The Schnabel formula with the Chapman modification was used (Ricker 1975):

$$\hat{N} = \frac{\sum MC}{\sum R + 1}$$

where: \hat{N} = the population estimate
 $\sum MC$ = the sum of the products of total catch and total number of marked fish at large for each sample
 $\sum R$ = the sum of recaptures for all samples

with standard error: $SE(\hat{N}) = \frac{1}{\sqrt{\frac{ER}{(\sum MC)^2}}}$

Young-of-the-year trout were not adequately sampled from most transects to obtain estimates of total numbers. Most of the population estimates obtained for Henrys Fork tributaries in 1983 are for age I+ and older (usually larger than 80 mm) trout which were fully vulnerable to electrofishing. For transects on smaller streams where young-of-the-year were adequately sampled, separate estimates were calculated for young-of-the-year and age I+ and older fish.

Trout Population Estimates - Snorkeling

The mainstems of Warm River, Robinson Creek, and Buffalo River were too large or inaccessible to sample effectively by electrofishing, but had sufficient water clarity that the trout populations could be counted using conventional snorkeling gear. We used two methods to estimate trout populations: direct enumeration and area-density counts.

Direct enumeration counts were done in Boone Creek near Indian Lake and in Robinson Creek at the end of Road 470 where visibility was at least 50% of the stream width. In those areas, the entire channel could be counted by two observers. One observer moved upstream along one bank and counted out towards the center of the stream and counted all trout between himself and the center. The other diver moved upstream in the center of the channel and counted all trout between himself and the opposite bank.

Two replicate counts were made in Robinson Creek, and a single count was made in Boone Creek. The number of trout of each species larger and smaller than 330 mm were recorded. Since the entire stream channel was counted by this method, the population estimates for the transects were the means of the replicate counts for each species.

In areas that could not be counted from bank-to-bank by two divers, we used area-density methods to estimate trout populations (Schill 1983). Divers crawled upstream at arm's length from the bank and counted out towards the center of the stream. The number of trout of each species greater and less than 330 mm total length were recorded. When divers reached the upstream end of the transect, they floated back downstream in the center of the channel counting fish seen in both directions. Each diver made three replicate counts of bank and center strips of the transect.

The total numbers of trout in each transect were estimated by summing the estimates for each bank with an estimate for the center based on the densities of trout observed while drifting downstream. Visibility was determined each day as the maximum distance at which an object similar in size to the fish in the transect could be identified (Schill 1983). We later returned and measured the area of the transect. The area included in the bank portions of the transects were obtained by multiplying the length of bank snorkeled by visibility + 1 m (since we crawled upstream at arm's length from the bank]. Fish abundance in the bank areas was estimated by averaging the replicate counts.

The area covered by the center counts was the product of the transect and two times the visibility (since divers counted to both sides]. Mean density of trout in the center area was estimated by dividing the mean of the replicate counts by the area covered by the center counts. Total numbers of trout in the center area was estimated by multiplying mean density by total center area (total transect area minus bank areas). Estimates of total numbers of trout in the transect were then obtained by adding the bank area estimates to the center area estimate.

Fish Movements

Signs requesting anglers to provide information on species, size, location caught, and tag numbers of tagged fish caught were posted at access points throughout the drainage. Fish movements were assessed from information supplied by anglers who caught tagged fish. The distance moved upstream or downstream from the point of tagging was recorded for all tag returns whenever possible.

Age and Growth

Scales were obtained from 471 brook trout, 88 wild rainbow trout, 17 rainbow-cutthroat trout hybrids, 31 cutthroat trout, 50 brown trout, and 8 mountain whitefish from Henrys Fork tributaries in 1983. Wet mounts of scales were viewed at 93x magnification, and distances to annuli and to the scale margin along the anterior radius of the largest non-regenerated scale in each sample were recorded to the nearest millimeter. Since annuli were very distinct and age groups by scale analysis corresponded well to length-frequency distributions, it was unnecessary to recheck age

determinations for brook trout, rainbow trout, and rainbow-cutthroat hybrids. Scales from all brown trout, cutthroat trout, and whitefish were re-read with nearly 100% agreement.

Body-scale regressions were performed for each species at each sampling location. Lengths at annuli were back-calculated using the traditional Lee equation:

$$L_N = C + \frac{S_N}{S} (L - C)$$

where: L_N = back-calculated length at annulus N
C = correction factor (intercept of body-scale regression or length at scale formation)
 S_N = radius of scale to annulus N
S = radius of scale to margin
L = total length of fish at capture

No correction factor was applied for back-calculating lengths at annuli for brook trout or whitefish based on body-scale regressions for brook trout and literature values for whitefish listed in Carlander [1976]. Since sample sizes were small for other species and the body-scale regressions had poor fits, I chose literature values of 35 mm for wild rainbow and rainbow-cutthroat hybrids, 30 mm for cutthroat trout, and 40 mm for brown trout from Carlander [1976] to use as correction factors for back-calculating lengths at annuli.

Survival

The range in length for each age class (determined from representative scale samples) were applied to length-frequency distributions of total catch to determine the number of fish from each age class sampled by electrofishing from Henrys Fork tributaries in 1983. Catch curves (natural logarithm of number of fish vs age) were plotted to determine at which age fish were completely recruited. The mortality coefficient (Z) and annual survival (S) were computed from catch curves as described by Ricker [1975].

Migration Barriers

Natural and man-made barriers to fish migration were located by examining topographic maps and surveying the Henrys Fork tributaries in 1983. Natural barriers consisted of waterfalls and steep cascades. Man-made barriers included dams (irrigation and hydrodams) and culverts. Barriers to fish migration were photographed, and their locations were noted.

Spawning Activity

Rainbow trout spawning activity was observed in Warm River from the Highway 47 bridge to 3 km above Warm River campground on March 24, 1983 and March 22, 1984. Redd counts were performed by snowmobiling along the bank and along the abandoned railroad right-of-way paralleling the river.

FINDINGS

Fish Species Distribution

Twelve species of fish were collected by electrofishing or observed white snorkeling in Henrys Fork tributaries in 1983 (Tables 1-4). Salmonid species included: brook trout (Salvelinus fontinalis), rainbow trout (Salmo gairdneri), cutthroat trout (Salmo clarki), rainbow-cutthroat hybrids, brown trout (Salmo trutta), and mountain whitefish (Prosopium williamsoni). Cutthroat trout and mountain whitefish are the native salmonid species in the upper Henrys Fork drainage (Simpson and Wallace 1978). Natural reproduction of all species occurs in the study waters, and rainbow and brown trout are stocked in many streams.

Other species sampled include sculpins, Utah suckers (Catostomus ardens), mountain suckers (Catostomus platyrhynchus), longnose dace (Rhinichthys cataractae), speckled dace (Rhinichthys osculus), and reddsides (Richardsonius balteatus). Utah chubs (Gila atraria) are present in the drainage (Simpson and Wallace 1978), but were not collected or observed in Henrys Fork tributaries in 1983. Both mottled sculpin (Cottus bairdi) and piute sculpin (C. beldingi) are reported native to the drainage by Simpson and Wallace (1978), but they were not distinguished from each other in this study.

Salmonid Abundance and Species Composition

Electrofishing Samples

Numbers of fish sampled, mean lengths, mean weights, and condition factors of trout collected for all transects on Henrys Fork tributaries in 1983 are summarized in Appendix B. A total of 2,000 brook trout were measured, ranging in length from a 21 mm fry sampled from Snow Creek to a 311 mm fish shocked in Buffalo River. Brook trout of 400+ mm were observed while snorkeling in lower Warm River and in Lower Robinson Creek. Mean lengths of brook trout ranged from 80 mm in the headwaters of Warm River to 196 mm in Warm River below Warm River campground. Condition factors ranged from 1.22 in Fish Creek to 1.67 in Rock Creek.

Table 1. Distribution and relative abundance³ of fish species collected by shocking or observed by snorkeling in Robinson Creek and tributaries, 1983.

Stream – transect	Location				2													
	T	R	Sec- tion	Stream order	RRK	UDR	HRR	HYR	CTI	BRN	MWF	MSC	IHS	MSII	LND	SAD	RSS	
<u>Robinson Cr.</u>																		
Above Falls YNP	10N	45E	1	2					A									
Below Falls YNP	10N	45E	24	2	C				C			C						
End Rd 470	9N	45E	5	3	C	A				C								
Canyon Pool and Run	9N	44E	17	4	C	A				C	A			A				
Three Rivers Ranch	9N	44E	13	4	C	C				C	A			A				
<u>Little Robinson Cr.</u>																		
Above Junction w/ Robinson Cr. YNP	10N	45E	23	2	A				C			C						
<u>Snow Cr.</u>																		
Headwaters	11N	45E	34	1	A													
Upstream from Rd 527	10N	45E	9	2	A													
Above Snow Cr. Road culvert	10N	45E	31	2	A				R			C						
Below Snow Cr. Road culvert	10N	45E	31	2	C							A						
<u>Rock Cr.</u>																		
Upstream from last crossing of Cave Falls Rd.	9N	45E	11	2	A							C						
End of Rd 247	9N	45E	16	3	A				R			C			C			
Below Rd 490	9N	44E	24	3	A	R		R	R		C	C			C			
<u>Wyoming Cr.</u>																		
Upstream from Rd 124	9N	46E	18	2					R	A		C						
Downstream from Rd 124	9N	46E	18	2						A		C						
End of Rd 573	9N	45E	13	2								C						
End of Rd 576	9N	45E	14	2					C	C		C						
<u>Beaver Cr.</u>																		
Upstream from Cave Falls Rd	9N	45E	10	1	A							C						

Table 1. Continued.

Stream – transect	Location			Stream order	Species ²												
	T	R	Sec- tion		RRK	WRR	HRR	HYR	CTT	RAN	MWF	MSC	HSU	MSII	IND	\$PR	RSS
<u>Sprina Cr.</u>																	
End of Rd 490	9N	44E	13	1	C										A		
<u>Porcupine Cr.</u>																	
In Howell Ranch	9N	44E	25	2	A					R		C		C			
Parallel to																	
Cave Falls Rd	9N	44E	24	2	A							C		C	C	A	
Guard Station GAWS	9N	44E	23	2	A	R		R		R		C		C	C		C
<u>Rising Cr.</u>																	
Along Cave Falls Rd	9N	44E	24	1	C					C		C					
<u>Fish Cr</u>																	
North Fork CAWS	ION	44E	35	1	A												
Near Stephens																	
<u>Fish Cr Ranch</u>	AN	44F	A	2	A				H--					C			

¹ Relative Abundance – Rare (R), Common (C), Abundant (A).

² Species Abbreviations – Brook Trout (BRK), Wild Rainbow (WRB), Hatchery Rainbow (MR), Rainbow – Cutthroat Hybrids (HYB), Cutthroat (CTT), Brown Trout (SRN), Mountain Whitefish (MWF), Mottled Sculpin (MSC), Utah Sucker (USU), Mountain Sucker (MSU), Longnose Dace (IND), Speckled Dace (SPD), Redside Shiner (ASS).

Table 2. Distribution and relative abundance¹ of fish species collected by shocking or observed by snorkeling in Warm River and tributaries, 1983.

Stream - transectt	Location			Stream order ³	Species ²										MSC	LISl	MSII	1 NR	SPl	BSS
	T	R	tion		RRK	WRR	HAR	HYB	ITT	RAN										
Warm River															-					
Headwaters below																				
Scout Camp	11N	44E	20	1	C										C					
Above junction with																				
Partridge Cr.	11N	44E	19	1	A	C	R			R					C					
Pole Bridge																				
Campground GAWS	11N	44E	20	2	C	A	A								C					
1 km below Pole																				
Bridge Campground	11N	44E	29	2	C	C					C	C			C					
CAWS above Warm R.	ION	44E	10	2	C	C	C				C	C			C					
Springs																				
Snorkel transact																				
above Cascade	ION	44E	21	2	C	A		R		R	A					A				
Snorkel transact																				
below Cascade	ION	44E	21	2	C	A				R	A						A			
Warm R. Campground	9N	44E	8	2	C	A	A			A	A				C		A			
<u>Partridge Cr.</u>																				
End of Rd 499	11N	44E	2	2	A															
Junction w/Warm R.	11N	44E	20	2	A										C					
<u>Moose Draw</u>																				
Junction Warm R.					C	f	C													

¹ Relative Abundance - Rare (R), Common (C), Abundant (A).

² Species Abbreviations - Brook Trout (BRK), Wild Rainbow (WRB), Hatchery Rainbow (HRB), Rainbow - Cutthroat Hybrids [HYB), Cutthroat (CTT), Brown Trout (SRN), Mountain Whitefish (MWF), Mottled Sculpin (MSC), Utah Sucker (USU), Mountain Sucker (MSU), Longnose Dace (LND), Speckled Dace (SPD), Redside Shiner (ASS).

³ Several large springs add volume to Warm River without increasing stream order.

Table 3. Distribution and relative abundance¹ of fish species collected by shocking or observed by snorkeling in Falls River and tributaries, 1983.

Stream - transect	Location			Stream order	Species ²													
	T	R	Sec- tion		BRK	W	4	MAR	VVB	CTT	BRA	MWF	MSC	USI	MSII	I	SPD	RSS
<u>Falls River</u>																		
Angling above Sheep Falls	9N	45E	25	5				A										
Snorkeling at Marysville Diversion	9N	44E	35	5			A				A							A
Snorkeling at Kirkham Bridge	9N	43E	35	5			A				A			A				
<u>Boone Cr.</u>																		
Near Wyoming border below Indian Lake	9N	46E	29	3	R	R			R			C		C	A		C	
CAWS Station at Rd 042	9N	45E	35	3		R			R			C		C	C			
<u>Conant Cr.</u>																		
CAWS Station near Buggy Springs	8N	45E	23	3	C	C			R	R		C	C		C	C		
Campsite below Buggy Springs	8N	45E	22	3	C	C						C	C		C	C	C	
Below Rd 263	8N	45E	21	3	C	C			R			C						
At Henry Meadows Rd. Crossing	-	8N	44E	28	3	C	C					C	C		C	C	A	
<u>Squirrel Cr.</u>																		
At end of Rd 580	8N	46E	5	3	A					C			C		C	C	C	C
Downstream from Bergman Ditch Diversion	8N	45E	4	3					R	R			C		C	C	C	
Downstream from Crossing of Rd 263	BN	45E	5	3					R				C		C	C	A	A
Downstream from Squirrel Rd	RN	44E	IA	3	A								C		C	C	C	C

¹ Relative Abundance - Rare [R], Common (C), Abundant (A).

² Species Abbreviations - Brook Trout (BRK), Wild Rainbow [WAS), Hatchery Rainbow (HRB), Rainbow - Cutthroat Hybrids [HYB), Cutthroat (CTT), Brown Trout (BRN), Mountain Whitefish (MWF), Mottled Sculpin (MSC), Utah Sucker (USU), Mountain Sucker (MSU), Longnose Dace (LND), Speckled Dace (SPD), Bedside Shiner (BSS).

Table 4. Distribution and relative abundance¹ of fish species collected by shocking or observed by snorkeling in Buffalo River and tributaries, 1983.

Stream – transect	Location			Stream order	Species ²												
	T	R	Sec- tion		RRK	WRR	HRR	HYB	CTT	RRN	MWF	MSC	IIII	MS11	I Nn	.SPn	RSS
<u>Buffalo River</u>																	
T13N, R44E Section 20	13N	44E	20	2	A	A											
Above Buffalo Campground	13	44E	26	3	A												A
Below US 20 Bridge																	
by Pond's Lodge	13N	44E	27	3	C	C	C										
<u>Chick Cr.</u>																	
Upstream from Rd 291	13N	44E	21	2	C	C							C				

¹ Relative Abundance – Rare (R), Common (C), Abundant (A).

² Species Abbreviations – Brook Trout (BRK), Wild Rainbow (WRB), Hatchery Rainbow (HRB), Rainbow – Cutthroat Hybrids (HYB), Cutthroat [CTT], Brown Trout (SRN), Mountain Whitefish (MWF), Mottled Sculpin (MSC), Utah Sucker (USU), Mountain Sucker (MSU), Longnose Dace (LND), Speckled Dace (SPD), Redside Shiner (RSS).

We sampled 378 wild rainbow trout ranging in Length from 45 mm (Buffalo River) to 362 mm [Conant Creek) with mean lengths ranging from 91 mm [Moose Draw) to 244 mm (Warm River). Condition factors ranged from 1.15 in Porcupine Creek to 1.76 in Moose Draw. Individual hatchery rainbow trout (46 sampled) ranged in total Length from 172 mm [Moose Draw] to 254 mm [Warm River), and mean Lengths ranged from 189 mm (Moose Draw) to 244 mm [Warm River above Partridge Creek). Condition factors of hatchery rainbow ranged from 0.94 in Squirrel Creek to 1.25 in warm River above Partridge Creek and were generally Lower than those of wild rainbow.

Cutthroat trout (47 collected in 1983) ranged from 72 mm [Fish Creek) to 315 mm (Boone Creek), but larger specimens were caught by angling in Boone Creek and observed while shocking in Robinson Creek above the impassable falls in Yellowstone National Park. Mean lengths of cutthroat ranged from 80 mm in Squirrel Creek to 236 mm in Wyoming Creek, and condition factors ranged from 1.09 (Conant Creek) to 1.59 (Squirrel Creek)].

Brown trout (97 fish collected) ranged from 52 mm (Warm River) to 338 mm [Porcupine Creek] in total Length, and mean lengths ranged from 71 mm [Moose Draw) to 289 mm (Porcupine Creek) (Appendix 8). Condition factors ranged from 1.23 (Warm River) to 1.95 [Porcupine Creek).

Species Composition

Brook trout generally comprised the greatest proportion of the salmonid populations in the transacts sampled by snorkeling and electrofishing in 1983 (Tables 5-8, Appendices C & D). Headwater tributaries often contained only brook trout or brook trout and sculpins. Rainbow trout were only common in the lower canyon section of Robinson Creek (Table 5, Appendix C), but were common in most areas of the Warm River (Table 6, Appendix C], Falls River (Table 7) and Buffalo River (Table 8) drainages.

Cutthroat trout are the native species in all drainages, but were the dominant species only in Robinson Creek in Yellowstone National Park (Table 5). Rainbow-cutthroat hybrids were observed in most waters where rainbow and cutthroat occurred sympatrically. Brown trout were the dominant species in Wyoming Creek and were quite common in Warm River and Robinson Creek.

Salmonid Abundance

Densities of age I+ and older trout in Robinson Creek and tributaries ranged from 24 fish/km in Snow Creek to 1,416 fish/km in a deep pool of a canyon reach on lower Robinson Creek [Table 5). Population densities generally ranged from 200 to 500 fish/km. Fry (Less than 100 mm) were

Table 5. Summary of population estimates and species composition of age I+ and older trout in Robinson Creek and tributaries, 1983. Numbers in parentheses represent values for young of the year.

Stream - transect	Data	Transact		Trout captured ¹			Population estimate			Species	Remarks
		Length x Width (M)	Method	C ₁	C _p	C ₃	Transact	#/km	#/ha	composition	
<u>Robinson Cr.</u>											
Above Falls YNP	7/27	500	1 Pass	8 (0)	-	-	-	-	-	100% CTT	High conductivity due to thermal spgs. reduced shocker efficiency.
2 km above Little Robinson Cr. YNP	7/27	113	1 Pass	2 [0]	-	-	-	-	-	100% CTT	"
1 km above Little Robinson Cr. YNP	7/27	104	1 Pass Snorkel	3 (0)	-	-	-	-	-	100% CTT	"
End Rd 470	9/14	190 x 6	Count	See Appendix C			49±7	255	425	57% BRN, 32%WRB, 11%BRK	whitefish & suckers
Canyon - Run	9/14	63 x 14	"	"	"	"	47±9	746	534	22%BRK, 21%BRN	abundant.
Canyon - Pool	9/14	60 x 15	"	"	"	"	85+29	1416	944	80%WRB, 13%BRK, 7%BRN	"
Three Rivers Ranch	10/6	165 x 20		"	"	"	41+24	248	126	50%WRB, 25%BRK 25%BRN	
<u>Little Robinson Cr.</u>											
Above junction w/ Robinson Cr. YNP	7/27	186	2 Pass	25 (22)	7 (10)	-	35+6 (40+14)	188 (215)		82%BRK, 1%•CTT	I+ older <77 mm 0+ <62 mm
<u>Snow Cr.</u>											
Headwaters	6/22	230 x 1.5	2 Pass	15 (1)	5 [0]	-	23+7 28+22	100	667	100%BRK	I+ >65 mm
Upstream from Rd 527	6/22	210 x 2	2 Pass	13 (3)	7 (0)	-	(5+2)	133	667	100%BRK	I+ >60 mm
Above Snow Cr. Rd Culvert	6/22	265	1 Pass	12 (0)	-	-	-	-	-	92%BRK, 8%CTT	
Below Snow Cr. Rd Culvert	6/22	200	1 Pass	4 (0)	-	-	-	-	-	100%BRK	

Table 5. Continued.

Stream - ^A transect	Date	Transect		Trout captured ¹			Population estimate			Species composition	Remarks
		Length x Width (M)	Method	C ₁	C _p	C ₃	Transect	#/km	#/ha		
<u>Rock Cr.</u>											
Upstream from last crossing of Cave Falls Rd	7/8	150	3 Pass	16	22	3	50+16	333	-	100%BRK	No young-of-the-year collected
End Rd 247	7/15	109 x 9	3 Pass	28 (0) 3	14 (2)	7 (3)	54±8	495	550	98%BRK, 2%CTT	I+ older >80 mm 0+ <59 mm
Below Rd 490	7/12-14	650 x 9	Schnabel	See Appendix D			851+160	1309	2042	99%BRK, 1%WRB, <1%HYB, <1%CTT	
<u>Wyoming Cr.</u>											
Upstream from Rd 124	7/8	185	2 pass	15	2	-	17±3	92		93%BRN, 7%CTT	
Downstream from Rd 124	7/12	325	2 Pass	11	4	-	17±7	52		93%BRN, 7%CTT	
End of Rd 573	7/6	115	1 Pass	1	-	-	-	-	-	100%CTT	
End of Rd 576	7/13	175	2 Pass	8	3	-	13±7	74	-	28%BRN, 72%CTT	
<u>Beaver Cr.</u>											
Upstream from Cave Falls Rd	7/8	115	3 Pass	13 (12)	17 (6)	4 (0)	35+4 (Not dipped after 1st run)	304	-	100%BRK	1st run shocker battery Low, 2nd & 3rd runs generator shocker.
<u>Spring Cr.</u>											
End of Rd 490	6/29	77	2 Pass	14 (4)	1 (0)	-	15+2 [4+2]	195 (52)		100%BRK	I+ >90 mm 0+ <72 mm

Table 5. Continued.

Stream – transect	Date	Transect		Method	Trout captured.¹			Population estimate		Species	Remarks	
		Length x Width (M)			C ₁	C _p	C _a	Transect	#/km	#/ha		composition
<u>Porcupine Cr.</u>												
In Howell Ranch	6/29	275		2 Pass	59 [5]	19 (1)	–	87±10 (6+3)	316 (22)		99%BRK, 1%BRN	I+ >115 mm 0+ <63 mm
Parallel to Cave Falls Rd	6/28	125 x 3.5		2 Pass	23 (10)	7 (7)		33+7	264	754	100%BRK	I+ >92 mm 0+<70 mm
Guard Station CAWS	6/30	380		2 Pass	61 (8)	26 [4]	–	106+17 (16±14)	278 (42)		95%BRK, 2%WRB 2%BRN, 1%HYB	I+>91 mm 0+<79 mm
<u>Rising Cr.</u>												
Along Cave Falls Rd	6/28	125 x 1		2 Pass	14 (4)	3 (0)	–	18+3 (4±2)	144 (32)	1440 (320)		
<u>Fish Cr.</u>												
North Fork CAWS	6/22	155 x 2		3 Pass	47 (2)	27 (1)	15 (1)	106+19 (4±2)	683 (26)	3419 839	100%BRK	I+ >65 mm 0+ <63 mm
Near Stephens Fish Cr. Ranch	6/23	330 x 4		3 Pass	47	38	19	142+41	426	1076	98%BRK, 2%CTT	All trout >92 mm

¹ For transacts estimated by mark-recapture C₁=M, C₂=C, C₃=R.² Data for snorkel transact estimates are given in Appendix B.³ Data for the Schnabel population estimate in Rock Creek below Rd 490 are given in Appendix D.

Table 6. Summary of population estimates and species composition of age I+ and older trout in warm River and tributaries, 1983.
Numbers in parentheses represent values for young-of-the-year.

Stream - transect	Date	Transect Length x width (M)	Method	Trout captured ¹			Population estimate			Species composition	Remarks
				C ₁	C _p	C ₃	Transac	#/km	#/ha		
Warm River											
Headwaters below				10	10	0	21+3	191			I+ >71 mm
Scout Camp	8/4	110	3 Pass	(13)	[7]	(5)	(29±10)	(264	-	100%BRK	0+ <61 mm
Above junction			Mark-re-	72	71	22				93%BRK, 4%WRB,	I+ >92 mm
ix/Partridge Cr.	7/26-28	250	capture	(11)	(4)	(0)	232+77	928	-	2%HRB, 1%BRN	0+ <72 mm
Pole Bridge Campground				43	23	11	88+12	392	605	48%BRK, 3%HRB,	I+ >103 mm
GAWS	7/26	224 x 6.5	3 Pass	(4)	[0]	(0)	(4±1)	(18)	(27)	36%WRB, 12%BRN	0+ <69 mm
1 km downstream from			Mark re-	14	24	3	52+29	304			I+ >120 mm
Pole Bridge Campground	8/29-31	171	capture	(11)	(17)	(5)	(69±38)	(404)		98%BRK, 2%WRB	0+ <92 mm
GAWS above warm			Mark re-	44	96	17				48%BRK, 3%HRB,	Estimate of 0+ not
River Springs	7/27-29	620 x 10	capture	[10]	[3]	(0)	248±101	400	400	36%WRB, 12%BRN	possible-no recaptures.
Snorkel Transect			Snorkel							98%WRB, 1%BRK,	whitefish
above Cascade	8/3/82	155 x 15	Count	See Appendix C			251	1619	1058	<1%BRN	estimate 57.
	3/21	155 x 15	Count	See Appendix C			148	955	624	96%WRB, 4%BRK	whitefish estimate 41.
	8/31	119 x 15	Count	See Appendix C			223	1866	1163	97%WRB, 3%BRK, 4%BRN	whitefish abundant.
Snorkel transect			Snorkel								whitefish estimate
below Cascade	8/30	81 x 22	Count	See Appendix C			27	380	161	100%WRB	247, Sucker estimate 89.
Warm R. Campground	6/20	1500 m (Approximately)	Boat Shocker	110	-	-	-	-	-	63%WRB, 32%BRN	One run only.
Partridge Cr.										3%BRK, 3%HRB	
				59	30	14	115+13	958			I+ >72 mm
End of Rd 499	6/16	120	3 Pass	(6)	(3)	(1)	(10±2)	(83)	-	100%BRK	0+ <59 mm
				31	8	-	42+6	157	-		I+ >89 mm
Junction with Warm R..	8/4	268	2 Pass	(34)	(14)	-	(58±13)	(216)	-	100%BRK	0+ <70 mm
Moose Draw				12	0	-	12+2	120	-	51%WRB, 5%BRN,	
Junction with Warm R.	8/31	100	2 Pass	(21)	(6)	-	[29±6]	(290)	-	18%BRK, 8%HRB	0+ <92 mm

¹ For transacts estimated by mark-recapture C₁=M, C₂=C, C₃=R.

Table 7. Summary of population estimates and species composition of age I+ and older trout in Falls River tributaries, 1983. Numbers in parentheses represent values for young-of-the-year.

Stream - transect	Date	Transect		Method	Trout captured		Population estimate		Species composition	Remarks	
		Length x width (M)			C ₁	C _p	Transect	#/km			
<u>Boone Cr.</u>											
Near Wyoming border below Indian Lake	8/8	250		1 Pass	1	-	-	-	-	100%BRK	2 CTT caught by angling prior to shocking.
	8/12	250		Snorkel Count	See Appendix C 1		-	-		100%WRB	
GAWS Station Rd 042	8/17	200		1 Pass	2	-	-	-	-	50%CTT,50%WRB	Trout avoided capture in deep pools.
<u>Conant Cr.</u>											
GAWS Station near Buggy Springs	8/5-11	590 x 9		Mark-Re- capture	42	42	10	168±82	285	431 59%BRK,4%HYB, 36%WRB,1%CTT	0+ not dipped quantatively; Juvenile whitefish present..
Campsite below Buggy Springs	8/10-11	170		Mark-Re- capture	10	27	4	77±55	453	- 54%BRK,46%WRB 50%WRB,	Shocker efficiency low due to deep pools; 8 whitefish captured.
Below Rd 263	8/5	200		1 Pass	4	-	-	-	-	- 25%BRK,25%HRB	0+ not dipped quantatively; Juvenile whitefish present.
At Henry Meadows Road Crossing	8/19	160		3 Pass	9	6	1	16±2	100	- 60%WHB,40%BRK	
<u>Squirrel Cr.</u>											
At end of Rd 580	8/12	144		2 Pass	38 [8)	12 [5)	-	56+8 21+31	389 146	77%BRK, - 23%CTT	YOY cutthroat present, I+ >96 mm, 0+ <72 mm.

Table 7. Continued.

Stream - transect	Date	Transect		Trout captured ¹			Population estimate			Species	Remarks
		Length x Width (M)	Method	C ₁	C ₂	C ₃	Transect	#/km	#/ha	composition	
<u>Squirrel Cr., Con't</u>											
Downstream from Bergman Ditch Diversion	8/18	200	1 Pass	2	-	-	-	-	-	50%HRB,50%CTT	
Downstream from Rd 263	8/12	150	1 Pass	2	-	-	-	-	-	100%HRB	Shocker efficiency low due to deep beaver ponds.
Downstream from Squirrel Rd	8/18-19	250	Mark-Re- capture	73 ² {3}	-	-	-	-	-	100%BRK	Estimate not possible due to mortality of marked fish.

¹ For transects estimated by mark-recapture C₁=M, C₂=C, C₃=R.

² Represents total catch of new fish for both days.

Table 8. Summary of population estimates and species composition of age I+ and older trout in Buffalo River and tributaries, 1983. Numbers in parentheses represent values for young-of-the-year.

Stream - transect	Data	Transect	Trout captured ¹			Population estimate		Species composition		Remarks
		Length x Width (M)	Method	C _i	C _p	C _a	Transact	#/km	#/ha	
<u>Buffalo River</u>										
T13N R44E Section 20	9/2-13	125	Mark-Re- capture [53]	59	45 (43)	13 0	197+101	1577	- 61%BRK, - 39%WRB	Estimate for 0+ not possible - no recaptures.
Above Buffalo Campground	9/1	335 x 39	Snorkel Count	See Appendix C			1694	5057	1850	100%BRK
Below US 20 Bridge			Snorkel							
by Pond's Lodge	9/1	265 x 50	Count	See Appendix C			160	604	121	75%RB,25%BRK
<u>Chick Cr.</u>										
Upstream from Rd 291	9/1	75	2 Pass	11 (13]	2 (3)		13+2 17+3	180 (230)	- 66%BRK, - 34%WRB	0+ <100
1 For transects estimated by mark-recapture C_i=M, C₂=C, C₃+R.										

generally quite abundant, but were not quantified. Moderate numbers of whitefish were observed in the Three Rivers Ranch and canyon areas of Robinson Creek.

Trout densities in Warm River and tributaries ranged from 120/km in Moose Draw to 1,866/km above the cascade (Table 6). Additionally, whitefish densities of 3,479 fish/km were found in Warm River below the cascade and 326 fish/km in Warm River above the cascade. The brook trout population in Partridge Creek at the end of Road 499 (958 fish/km) was very dense, as the average width of the stream is less than 5 m. Many adult fish had lesions on the backs and fin erosion, indicating some type of disease was present in that population. Brown trout were collected in Warm River above Partridge Creek, and brown trout fry were collected in Moose Draw, indicating natural reproduction may have occurred in upper Warm River. Brown trout from the 1982 fingerling plant were abundant in Warm River near the old fish hatchery (Warm River Springs), while browns from the 1980-82 plants were collected in the lower end of Warm River near Warm River campground.

Trout densities in Falls River tributaries ranged from a low of one fish in a 365 m section of Boone Creek near Indian Lake (3 fish/km) to 453 trout/km in Conant Creek (Table 7). Brook trout were generally the most abundant species, but rainbow trout were larger. Native cutthroat trout were present in moderate numbers (61 fish/km) in Squirrel Creek.

Trout densities in Buffalo River and tributaries ranged from 180 fish/km in Chick Creek to 5,057 fish/km in Buffalo River above Elk Creek (Table 8). Brook and rainbow trout were abundant, and in upstream areas, fry were very abundant. The dense concentration of brook trout in Buffalo River above Elk Creek contained individuals up to 350 mm (estimated by snorkeling).

Tag Returns and Fish Movement

Only 11 of the 459 tags (2.3%) placed on trout in Henrys Fork tributaries were returned by anglers in 1983. Four of the returns contained insufficient information to assess movements of fish from the location of tagging (Table 9). The returns containing specific information on the location of capture showed only one fish moving any significant distance from the location of tagging. It was a 292 mm brook trout caught the day after it was tagged in Conant Creek and had moved downstream approximately 6.3 km from Henry Meadows to the junction of Squirrel and Conant creeks.

Table 9. Summary of tagging and recapture data for returned tags from fish tagged in Henrys Fork tributaries, 1983.

Tag number	Species	Tagging data			Recapture data			
		Date	Location	Length	Date	Location	Length	Movement
B0205	HYB	6/20	Warm River Campground	250	7/16	Warm River Campground	270	None
B0203	WRB	6/20	Warm River Campground	321	6/26	Warm River	330	Insufficient report
80207	WRB	6/20	Warm River Campground	240	8/6	Warm River Campground	330	None
A0017	BRK	6/23	Fish Creek-Stephens Fish Creek Ranch	179	6/19	Fish Creek	254	Insufficient report
B15718	BRK	7/14	Rock Creek below Rd 490	202	8/17	Rock Cr. below Rd 490	209	None
A0091	BRK	7/14	Rock Creek below Rd 490	217	8/17	Rock Cr. below Rd 490	216	None
A0287	WRB	7/26	Warm River at Pole Bridge	211	8/12	Not reported	203	Insufficient report
A0280	HRB	7/26	Warm River at Pole Bridge	215	8/10	Warm River at Pole Bridge	Not Reported	None
K10220	WRB	7/26	Warm River at Pole Bridge	242	8/27	Warm River at Pole Bridge	254	None
K10235	WRB	7/29	Warm River at Springs	247	9/5	Spring Cr. (Warm River?)	254	Insufficient report
X603	BRK	8/19	Conant Creek at Henry Meadows	292	8/20	Junction Squirrel and Conant creeks	Not Reported	Downstream 6.4 km

Age and_Growth

Body-Scale Regressions

Annuli were generally quite distinct, and aging by scales was a rapid and efficient method for all populations. However, the relationships between total lengths and scale sizes were generally not consistent between populations, and body-scale regressions generally had poor fits. The best fits for body-scale regressions were for brook trout (r^2 values 0.48 to 0.97), but intercepts varied from -21 mm to 70 mm (Appendix E). Those regressions with best fits ($r^2 > 0.8$) usually had intercepts near zero, so zero was chosen as the correction factor for back-calculating brook trout length at annuli. The body-scale regressions for rainbow, hybrid, cutthroat, and brown trout generally had poor fits and very inconsistent intercept values because of small sample size. Literature values (Carlander 1969) were used for correction factors.

Back-Calculated Lengths

Weighted mean back-calculated Lengths (all age classes combined) for brook trout are summarized in Table 10. The oldest brook trout of 471 fish aged was one age IV+ individual sampled from Rock Creek below Road 490. For all Henrys Fork tributaries combined, back-calculated Lengths of brook trout ranged from 61 to 116 mm at annulus I, from 106-179 mm at annulus II, from 146-256 mm at annulus III, and the IV+ fish were 248 mm at annulus IV. Growth was slowest in cold, spring-fed headwaters of Snow Creek and Warm River and best in Falls River tributaries and Buffalo River.

The oldest wild rainbow trout sampled was a five-year-old fish from Warm River (Table 11). Wild rainbow lengths ranged from 92 to 117 mm at annulus I, from 127 to 194 mm at annulus II, from 203-253 mm at annulus III, from 213 to 313 mm at annulus IV, and 315 mm at annulus V.

Cutthroat trout ranged from 65 to 138 mm at annulus I, from 129 to 202 mm at annulus II, and from 203 to 288 mm at annulus III (Table 12). Hybrids ranged from 89 to 140 mm at annulus I, from 147 to 228 mm at annulus II, and one age III+ hybrid sampled from Warm River was estimated to be 269 mm at annulus III (Table 13).

Most brown trout sampled were age I+ and were apparently from 1982 fry plants, as many scales showed planting checks and some fish had deformed fins. Growth of brown trout was good, with Lengths at annulus I ranging from 77 to 173 mm (Table 14). Two age II+ browns sampled from Porcupine Creek averaged 239 mm at annulus II.

We took scales from mountain whitefish sampled from Rock Creek and Conant Creek. Lengths at annulus I ranged from 69 to 99 mm, from 141 to 175 mm at annulus II, from 212 to 215 mm at annulus III, and 244 mm at annulus IV (Table 15).

Table 10. Weighted mean back-calculated Lengths at annuli of brook trout collected from Henrys Fork tributaries in 1983.

			weighted mean back-calculated length (mm) at annulus:					
System	Stream	Transect	N	L [mm]	I	II	III	IV
Robinson Creek	Little Robinson Creek	Above Junc. w/Robinson Cr. YNP	21	133	84	141	209	
		Snow Creek	20	105	61	106	141	
		Upstream from Rd 527	19	96	70	114	116	
		Above Snow Cr. Road Culvert	15	111	82	146		
	Rock Creek	Upstream from Last Crossing of Cave Falls Rd	23	140	78	130	166	
		End Rd 247	31	146	92	156		
		Below Rd 490	35	173	95	161	212	248
	Beaver Creek	Upstream from Cave Falls Rd	25	132	83	150		
	Porcupine Creek	In Howell Ranch	16	183	102	161	232	
		Guard Station GAWS	17	148	97	156		
	Rising Creek	Along Cave Falls Road	9	118	76	171	210	
	Fish Creek	North Fork GAWS	31	114	74	122	161	
		Near Stephens Fish Cr. Ranch	38	155	85	147	176	
Warm River	Warm River	Headwaters below Scout Camp	12	91	68	128	170	
		Above Junction with Partridge Creek	12	165	92	158	207	
		Pole Bridge Campground GAWS	19	131	95			
		GAWS Above Warm R. Springs	13	130	99	170		
	Partridge Creek	End of Rd 499	37	150	76	138	199	
		Junction with Warm R.	10	134	72	140	168	
	Moose Creek	At Junction with Warm R.	4	139	106	164	234	
Falls River	Boone Creek	Near Wyoming border below Indian L.	1	144	82			
	Conant Creek	GAWS Station near Buggy Springs	15	199	103	176	246	
		At Henry Meadows Road Crossing	6	199	116	179		
	Squirrel Creek	Downstream from Squirrel Rd	19	141	97	162	217	
Buffalo River	Buffalo River	T13N R44E Section 20	13	171	113	160	256	
	Chick Creek	Upstream from Rd 291	10	111	79	135		

Table 11. weighted mean back-calculated lengths at annuli of wild rainbow trout sampled from Henrys Fork Tributaries in 1983.

					weighted mean back-calculated length (mm] at annulus:				
System	Stream	Transact	N	L	I	II	III	IV	V
Robinson Creek	Rock Creek	Below Rd 490	4	224	9	162	224		
	Porcupine Creek	Guard Station GAWS	2	155	1 0 8				
Warm River	Warm River	Above Junction w/Partridge Creek	5	227	1	151	198	225	
		Pole Bridge Campground GAWS	12	222	1	164	203	213	
	Moose Draw	GAWS Above Warm R. Springs	12	182	1	194	242	282	315
		At Junction with Warm R.	15	106	9 2	129			
Fall River	Conant Creek	GAWS Station near Buggy Springs	13	222	1	179	251	307	
		At Henry Meadows Road Crossing	8	244	1 0 5	187	253	313	
Buffalo River	Buffalo River	T13N R44E Section 20	11	150	1	168			
	Chick Creek	Upstream from Rd 291	6	101	8 7				

Table 12. Weighted mean back-calculated lengths at annuli of cutthroat trout sampled from Henrys Fork Tributaries in 1983.

System	Stream	Transact	N	L (mm)	weighted mean back-calculated length (mm) at annulus:		
					I	II	III
Robinson Creek	Robinson Creek	Above Falls YNP	14	183	108	165	203
	Robinson Creek	Below Falls YNP	5	162	107	167	205
	Little Robinson Creek	Above Junction w/Robinson Cr. YNP	9	184	133	175	239
	Rock Creek	Below Rd 490	2	182	138	193	
	Wyoming Creek	Upstream from Rd 124	2	185	104	129	
		End of Rd 576	9	214	95	172	209
Fall River	Boone Creek	Near Wyoming border below Indian Lk.	1	315	128	202	288
	Conant Creek	GAWS Station near Buggy Springs	1	185	129	159	

Table 13. weighted mean back-calculated lengths at annuli of rainbow-cutthroat hybrid trout sampled from Henrys Fork tributaries in 1983.

				weighted mean back-calculated length [mm] at annulus:				
System	Stream	Transect	N	L (mm)	I	II	III	IV
Robinson Creek	Rock Creek	Below Rd 490	1	215	114	190		
	Porcupine Creek	Guard Station GAWS	1	180	89	151		
Warm River	Warm River	Above Junction w/Partridge Creek	1	294	140	228	269	
Fall River	Conant Creek	GAWS Station near Buggy Springs	1	172	117	147		

Table 14. weighted mean back-calculated lengths at annuli of brown trout sampled from Henrys Fork tributaries in 1983.

System	Stream	Transact	N	L (mm)	weighted mean back-calculated length [mm) at annulus:	
					I	II
Robinson Creek	Wyoming Creek	Above and below Rd 124	29	183	135	
		End Rd 576	3	204	164	
	Porcupine Creek	In Howell Ranch	1	118	77	
		Guard Station GAWS	2	288	173	239
	Rising Creek	Along Cave Falls Rd	6	137	107	
Warm River	Warm River	GAWS above Warm River Springs	9	127	110	

Table 15. weighted mean back-calculated Lengths at annuli of mountain whitefish sampled from Henrys Fork tributaries in 1983.

System	Stream	Transect	N	I (mm)	weighted mean back-calculated length (mm) at annulus:			
					I	II	III	IV
Robinson Creek	Rock Creek	Below Rd 490	2	260	99	175	215	244
Fall River	Conant Creek	CAWS Station near Buggy Springs	6	156	69	141	212	

Survival

Estimates of annual survival of trout in Henrys Fork tributaries were generally very low. Brook trout survival estimates (Appendix F) ranged from 6% survival from year to year in a heavily fished area near Pole Bridge campground on Warm River to 47% near Buggy Springs on Conant Creek. Annual survival estimates for wild rainbow trout ranged from 21% in Buffalo River to 36% in Conant Creek near Buggy Springs (Appendix G). We did not obtain sufficient samples of cutthroat or brown trout to calculate survival estimates, but age class breakdowns of our electrofishing samples are listed in Appendices H, I and J. for these species.

Migration Barriers

Several natural and man-made migration barriers exist on the Henrys Fork and tributaries in the area studied in 1983 (Fig. 6). Natural barriers include impassable waterfalls and steep cascades. Waterfalls exist on the Henrys Fork (Sheep Falls, upper and lower Mesa Falls], on springs flowing into Warm River, on Robinson Creek in Yellowstone National Park, on Wyoming Creek, and on Falls River (Cave Falls and Sheep Falls). Steep cascades which may hinder fish passage exist on Warm River, Robinson Creek, Snow Creek, and Boone Creek.

Man-made barriers to fish passage include hydroelectric dams, irrigation dams, and culverts. Dams on the main Henrys Fork are Island Park Dam and Ashton Dam, and a hydroelectric dam near the mouth of Buffalo River prevents migration of fish from the Henrys Fork into the Buffalo River. Irrigation dams exist on the Henrys Fork just below the mouth of Falls River [Chester Dam), Falls River (three dams], and on Squirrel Creek (Bergman ditch diversion). An impassable culvert exists on Snow Creek at the crossing of Snow Creek Road.

Spawning Activity

Rainbow trout spawning activity in Lower Warm River was concentrated in the section from the Highway 47 bridge to the old railroad crossing in Warm River campground (Table 18). Fish from 300 to 400 mm in length were observed. The density of redds in 1983 decreased substantially above the Warm River campground even though large amounts of suitable spawning habitat was available. In 1984, six redds with trout on them were observed in the section from the Highway 47 bridge downstream to the confluence of Robinson Creek, but turbulent water made total counts impossible.

Table 16. Redd counts on Warm River from the Highway 47 bridge upstream during March, 1983 and 1984.

Section	Date	
	3/24/83	3/22/84
Highway 47 bridge to Fish Cr. bridge	30	34
Fish Creek bridge to old R.R. crossing	17	45
R.R. crossing to campground bridge	present ¹	not checked
Campground bridge to cascade	present ¹	not checked

¹ Uncountable due to light conditions.

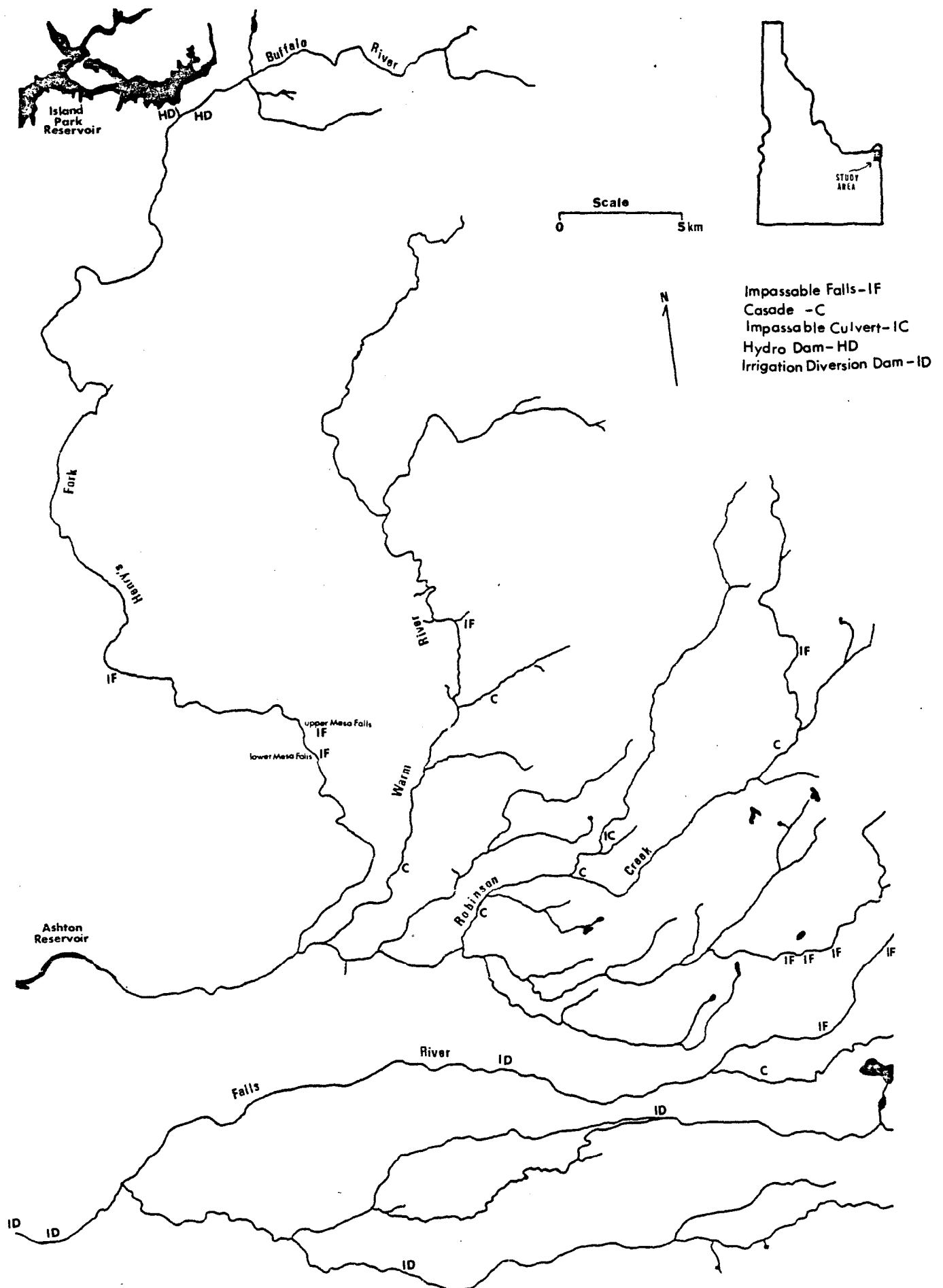


Figure 6. Natural and man-made barriers to fish migration in Henrys Fork and tributaries.

Rohrer (1984) conducted aerial redd counts of lower Warm River on April 11, 1983, and found 24 redds but noted that counting was difficult and not total. Counting was terminated above Warm River campground due to narrowing of the canyon (Bob Rohrer, pers. comm.).

DISCUSSION

Sampling Techniques

The backpack shocker was generally adequate for fish sampling in small- to medium-sized streams. Snorkeling was an efficient and accurate census technique in larger areas of Robinson Creek, Buffalo River, and Warm River, where steep canyon walls prevented boat access. The larger shocker mounted in a drift boat will work on lower Warm River from the Warm River campground to the fish observation area, but the portion from the fish observation area to the north is too dangerous to wade.

The main Falls River presented sampling difficulties, and we did not do any quantitative sampling in 1983. There are several rapids and irrigation dams, and access is limited due to steep canyons. We attempted snorkeling at two locations on Falls River on August 31, 1983, but visibility was too poor (<2 m) to obtain quantitative estimates of fish abundance. Numerous trout (200 to 250 mm) were seen, and young-of-the-year rainbow trout were very abundant. It would be possible to wade and shock in Falls River with a drift boat if put-in and take-out points could be located between rapids or dams.

Fish Species Distributions

Brook trout were ubiquitous in the waters sampled in 1983. They were present in all streams except above impassable falls on Robinson and Wyoming creeks. Brook trout were introduced to the upper Henrys Fork drainage in the late 1800's. They have not been stocked in Henrys Fork tributaries for many years, but populations have been maintained by natural reproduction.

Rainbow trout were found in all tributary drainages, mostly in larger streams (third order and larger). Catchable-size hatchery rainbow are stocked in Buffalo River, Warm River, Robinson Creek, Falls River, Conant Creek, and Squirrel Creek (IFG fish planting records). Natural reproduction by rainbow trout was evident in all waters where the species were found. Since rainbow trout are the primary species in the Henrys Fork, the relative contribution of tributary spawning will be assessed by tag returns and electrofishing in the main Henrys Fork in 1984 and 1985.

Cutthroat trout are the only native trout species in the upper Henrys Fork drainage (Simpson and Wallace 1978), but they were not found in the Warm River and Buffalo River systems and were greatly restricted in Robinson Creek and Falls River systems. Cutthroat were the only fish

species sampled from Robinson Creek above an impassable falls in Yellowstone National Park. The Robinson Creek cutthroat had a unique appearance in that spotting was greatly reduced, with a few large spots confined to the caudal peduncle. Body coloration was a bluish-green rather than olive-green that is typical for the Yellowstone Park cutthroat. Other cutthroat sampled from Henrys Fork tributaries appeared to be Snake River cutthroat (*Salmo clarki bouvieri*).

Rainbow-cutthroat hybrids occurred in Robinson Creek below the impassable falls and in several Robinson Creek tributaries; also in Boone, Squirrel, and Conant creeks and Warm River. Hybrids exhibited predominantly rainbow characteristics (small scales, numerous small spots, spots on head], but had slashes under their mandibles.

Brown trout in most waters were probably introduced as fry from Ashton Hatchery. Brown trout fry were distributed throughout the Warm River, Robinson Creek, and Henrys Fork drainages by Trout Unlimited volunteers in 1981 and 1982. The brown trout in Wyoming Creek were all age 1+ fish, and some had fin erosion. Browns were first introduced in Robinson Creek in the early 1970's (Idaho Department of Fish and Game county fish planting records], and natural reproduction is probably successful.

Salmonid Abundance

Salmonid population densities were quite variable in Henrys Fork tributaries, ranging to very low (3 fish/km in Boone Creek near Indian Lake) to very high (>5,000/km in Buffalo River above Elk Creek). In contrast, Rohrer (1981, 1983) estimated trout populations (fish >180 mm) to be about 3,000/km in the Henrys Fork below Island Park Reservoir and below Ashton Reservoir. Several factors probably influence trout population densities in Henrys Fork tributaries:

1. Stream size - the amount of water and habitat available limits population size of trout >100 mm. Small streams often had low population densities.
2. Productivity - we did not do chemical analysis, but Low conductivity was evident in many waters in the Warm River and Robinson Creek drainages. We had to use high voltage (600-700 v) to shock many streams. Low conductivity (limited productivity] probably affects trout growth as well as carrying capacity of many streams. Chemical analysis of water quality and conductivity measurements by Whitehead (1978) showed these observations to be valid.
3. Depth and cover - the highest densities of trout >100 mm were found in areas with deep pools. The snorkel transects in Warm River above and below the cascades and in the deep pool in Robinson Creek were >3 m deep and held high densities of trout, whitefish, and suckers. The snorkel transect on Buffalo River above Elk Creek [5,057 trout/km) had pools 1.5-2 m deep, and trout were congregated in the pools.

4. Spring flooding - Buffalo River and Warm River are primarily spring-fed systems that do not fluctuate greatly during runoff. The Robinson Creek drainage has several spring-fed streams, and fluctuation was moderate during the 1983 runoff season. Runoff from Falls River and tributaries was very heavy in 1983, and high water prevented us from sampling until Late July. Boone, Squirrel, and Conant creeks showed evidence of severe flooding (bank cutting and debris jams). Trout densities in these streams (especially Boone Creek) were generally lower than in similar-sized streams in the other drainages. It is possible that trout densities are low due to these high flows during the 1983 runoff.
5. Angling - we did not do creel census in 1983, so estimates of angler effort and harvest are not available. We did observe evidence of angling at points with easy access, especially on Warm River. Population densities of trout larger than 100 mm were more than 2.5 times higher in Warm River above Partridge Creek (not near an access road) than at Pole Bridge campground, which was less than 5 km downstream (Table 8). Localized angling effort may reduce fish populations near access areas in Henrys Fork tributaries making stocking necessary. However, most of the drainages are relatively inaccessible, and fish populations are probably not overexploited.
6. Habitat degradation - habitat degradation does not appear to be a serious problem affecting the fisheries in the tributaries studied. There is extensive logging on the Targhee National Forest, but buffer strips, proper road construction, and flat terrain minimize sedimentation. Losses of fish to irrigation diversions on Falls River, Squirrel Creek, and Conant Creek are unquantified.

GAWS Transacts

Aquatic habitat in four streams (five transects) were surveyed by Smith (1981, 1982) using the Forest Service General Aquatic Wildlife Survey (GAWS) and Region 1 [R-1] channel stability rating methods. We sampled fish populations at these locations to assess relationships between habitat parameters and fish abundance in Henrys Fork tributaries. The CAWS method involves measurements of channel width, water width, mean depth, and bottom cover. Pools are classified by percentage of the transect and by length and width, depth and shelter. The R-1 channel stability rating method classifies channel stability based on bank slope, channel obstructions, streambank vegetation, mass wasting, bank cutting, bottom composition, imbeddedness, and vegetative cover (low scores indicate high stability).

GAWS and R-1 stability data for Fish Creek, Rock Creek, Warm River (two transacts), and Conant Creek are summarized in Table 17, with fish species composition, population densities, and standing crops. Habitat

Table 17. Summary of habitat data¹ and fish population data² for GAWS Stations surveyed by electrofishing in 1983.

	North Fork Fish Creek	Rock Creek below Rd 490	Warm River above springs	Warm River at Pole Bridge	Conant Creek near Buav Springs
Mean channel width (m)	1.6	8.3	11.0	8.1	9.0
Mean water width (m)	1.5	6.4	10.0	6.5	6.6
Mean depth (cm)	17	21	26	31	18
Mean % pool	25	20	25	59	13
Mean pool rating	2.4	2.5	1.5	1.6	3
Bottom cover:					
% plants	5	0	0	1	0
% boulder	0	3	1	0	2
% rubble	0	79	15	55	27
% gravel	37	0	77	39	65
% sand/silt	53	18	7	4	9
R-1 channel stability rating	68	84	74	46	101
Species composition	100%BRK	98%BRK, 1%WRB <1%HYB, <1%CTT	48%BRK, 36%WRB, 12%BRN, 3%HRB	48%BRK, 29%HRB, 23%WRB	59%BRK, 36%WRB 4%HYB, 1%CTT
# fish/km	316±34	1309±320	400±163	364±13	285±35
# fish/hectare	2117±228	2045±500	400±163	546±20	431±211
Standing crop kg/hectare	70±8	128±31	25±10	40±2	48±24

¹ Habitat data for Fish Creek and Conant Creek from Smith (1981), habitat data for Warm River and Rock Creek from Smith (1982).

² Fish population and standing crop estimates for fish larger than 100 mm.

parameters and fish populations differed substantially between the transects. Correlation coefficients were computed for fish populations and biomass with all habitat parameters and R-1 channel stability ratings (Table 18). Fish abundance and biomass were not strongly correlated with width, depth, percent pool, mean pool ratings, R-1 channel stability ratings, percent plant cover or percent sand/silt bottom. Percent gravel cover was negatively correlated with standing crop ($r = -0.91$, $p < 0.05$) and fish abundance ($r = -0.81$, NS). There were also strong (but not statistically significant) positive correlations of percent rubblecover and percent boulder cover with fish abundance and standing crops.

The observed relationships are complicated by several factors. The GAWS and R-1 surveys were made one or two years prior to the fish population surveys, and habitat characteristics may have changed. Hatchery rainbow trout comprised substantial proportions of the standing crops of the Warm River transects, and harvest is probably not comparable between stations. It would be necessary to conduct concurrent measurements of habitat parameters and estimates of fish populations at several stations to adequately assess the ability of GAWS and R-1 to predict trout abundance and standing crops. Also, production of wild trout biomass would standardize fish populations between transects in spite of stocking and angling harvest.

Age, Growth and Survival

Growth rates of trout in Henrys Fork tributaries were quite variable, but generally slower than those for fish from the Henrys Fork. Brook trout sampled from the Henrys Fork above Island Park Dam by Coon (1978a) had a mean back-calculated Length at annulus I that was within the range of values calculated for fish from the tributaries. However, Henrys Fork brook trout were larger at annuli II and III than any of the tributary populations (Table 19). Rainbow trout from the Henrys Fork above Island Park Reservoir (Coon 1978b), in Box Canyon (Rohrer 1983), and below Warm River (Rohrer 1981) were consistently larger than wild rainbow from the tributaries at all annuli (Table 20).

The slow growth, relatively short longevity, and low survival of trout from Henrys Fork tributaries results in populations with small average size and few large individuals. Natural reproduction and recruitment appear to be adequate in all waters we surveyed in 1983. Utilization of fish populations which are composed of high densities of small fish could be increased by liberalizing the creel limit for brook trout. The brook trout bonus limit (10 brook trout in addition to the regular trout limit) in effect on Rock Creek has not resulted in overexploitation. Growth, mean size, survival, and population densities are comparable to or better than those in similar size tributaries [Warm River, Conant Creek, and Buffalo River] with the normal trout limit (six fish, no more than two over 405 mm) (Table 21). Extension of the bonus brook trout limit to all Henrys Fork tributaries would allow an increase in harvest opportunity to anglers of a relatively unexploited resource.

Table 18. Correlation matrix of habitat parameters measured at GAWS Stations to fish population abundance and to standing crop biomass.

Habitat Parameter ¹	Fish population parameter # fish/km		Standing crop (kg/hectare)	
	Correlation coefficient	significance ²	Correlation coefficient	Significance
Mean channel width (m)	0.16	NS	-0.28	NS
Mean water width (m)	0.10	NS	-0.36	NS
Mean depth (cm)	-0.07	NS	-0.42	NS
Mean % pool	-0.21	NS	-0.32	NS
Mean pool rating	0.17	NS	0.48	NS
Bottom cover:				
% plants	-0.34	NS	0.04	NS
% boulder	0.744	NS	0.628	NS
% rubble	0.78	NS	0.60	NS
% gravel	-0.80	NS	-0.91	P<0.05
% sand/silt	-0.04	NS	0.34	NS
R-1 channel stability rating	0.20	NS	0.26	NS

¹ Habitat data from Smith (1981, 1982).

² Critical value of r at significance level of 0.05 $r < -0.878$ or > 0.878 .

Table 19. Comparison of range in back-calculated Lengths at annuli of brook trout from Henrys Fork tributaries to mean back-calculated Lengths at annuli from Henrys Fork above Island Park dam.

Location	Back-calculated		At annulus	
	I	II	III	IV
Robinson Creek and tributaries	61-102	106-161	141-232	248
Warm River and tributaries	68-106	128-170	168-232	
Falls River and tributaries	82-116	162-179	168-234	
Buffalo River and tributaries	79-113	135-160	256	

Henrys Fork above Island Park Res. ¹	88	183	300	

¹ Data from Coon (1978b).

Table 20. Comparison of range in back-calculated lengths at annuli of wild rainbow trout sampled from Henrys Fork tributaries to mean back-calculated Lengths from three sections of the Henrys Fork.

Location	Back-calculated length at annulus_					
	I	II	III	IV	V	VI
Robinson Creek and tributaries	98-108	162	224			
Warm River and tributaries	92-117	129-194	198-242	213-282	315	
Falls River and tributaries	103-105	179-187	251-253	307-313		
Buffalo River and tributaries	87-113	168				

Henrys Fork above Island Park Res. ¹	111	217	322	391	488	546
Henrys Fork, Box Canyon to Last Chance ²	129	211	297	369	458	555
Henrys Fork below Warm River ³	138	228	292	359	426	

1	Data from Coon (1978b).					
2	Data from Rohrer (1983).					
3	Data from Rohrer (1981).					

Table 21. Comparison of brook trout populations, growth and condition in similar transects on Rock Creek, Warm River, Conant Creek and Buffalo River, 1983.

	Robinson Creek	Warm River	Falls River	Buffalo River
Stream	Rock Cr.	Warm R.	Conant Cr.	Buffalo R.
Transect	Along Rd 490	Above junc. w/Partridge Creek	Buggy Spgs.	T13N R44E Section 20
# fish/km	1309±320	928±308	285±139	1577±809
% brook trout	99	93	59	61
Mean length	157±6	140±6	155±18	121±8
Mean weight	63±8	46±10	137±30	107±24
Mean K	1.54	1.39	1.34	1.36
Length at annulus:				
I	95±6	92±8	103±9	113±10
II	161±10	158±22	176±9	160±25
III	212±15	207±8	246±10	256
IV	248			
Survival	0.36±0.04	0.21±0.06	0.35±0.12	0.13±0.09

Migration Barriers

Buffalo River Dam

The hydroelectric dam at the mouth of Buffalo River prevents upstream migration of fish from the Henrys Fork. Resident brook and rainbow trout are abundant, and population densities [away from major access areas) were among the highest observed in 1983. The Buffalo probably provides recruitment for the Henrys Fork from fish emigrating over the spillway of the hydrodam. The Buffalo has abundant spawning habitat along its entire length and could support a run of fish from the Henrys Fork. Large spawners could enhance the Buffalo River fishery [see letter in appendix of Rohrer 1983] if a fishway was constructed.

Warm River Cascades

Steep cascades exist on Warm River approximately 8 km upstream from the junction with the Henrys Fork. The cascades may hinder, but probably do not totally block, upstream migration of fish. We caught several rainbow-cutthroat hybrids above the cascades, which were probably migrants from Robinson Creek or the Henrys Fork, as we found no evidence of cutthroat in the Warm River drainage. Whitefish were also present above the cascade (at much lower densities than below the cascade], but we did not collect or observe whitefish in upper Warm River.

Falls River Irrigation Dams and Waterfalls

Three irrigation dams exist on Falls River, which are impassable to fish migration. The effects on these dams on fish migration and losses of fish to irrigation diversions need to be studied in 1984. Natural barriers also exist on Falls River at Sheep Falls and at Cave Falls.

Robinson Creek in Yellowstone Park

Impassable falls on Robinson Creek in Yellowstone National Park allow a population of cutthroat trout to remain isolated from hybridization with rainbow trout and from competition with brook and brown trout. The Robinson Creek cutthroat may represent a unique native strain that deserves further study.

Habitat Surveys

Pool habitat and spawning habitat on Robinson Creek, Warm River, Buffalo River, and Falls River tributaries in Targhee National Forest were surveyed by Rainville (1978). Pool habitat [cover for adult trout] and spawning habitat were subjectively classified as very good, good, fair, poor, or very poor, and maps were produced for each drainage. Maps of these surveys were reproduced and are included here for the Robinson Creek drainage (Fig. 7), Warm River drainage (Fig. 8), Falls River tributaries (Fig. 9), and Buffalo River drainage (Fig. 10).

Larger streams generally have good to very good pool and spawning habitat, and smaller streams generally have poor to fair pool habitat and fair to good spawning habitat. Poor spawning habitat exists on streams with extensive beaver activity, where continuous beaver dams do not provide adequate spawning gravel. None of the streams surveyed were classified as very poor habitat.

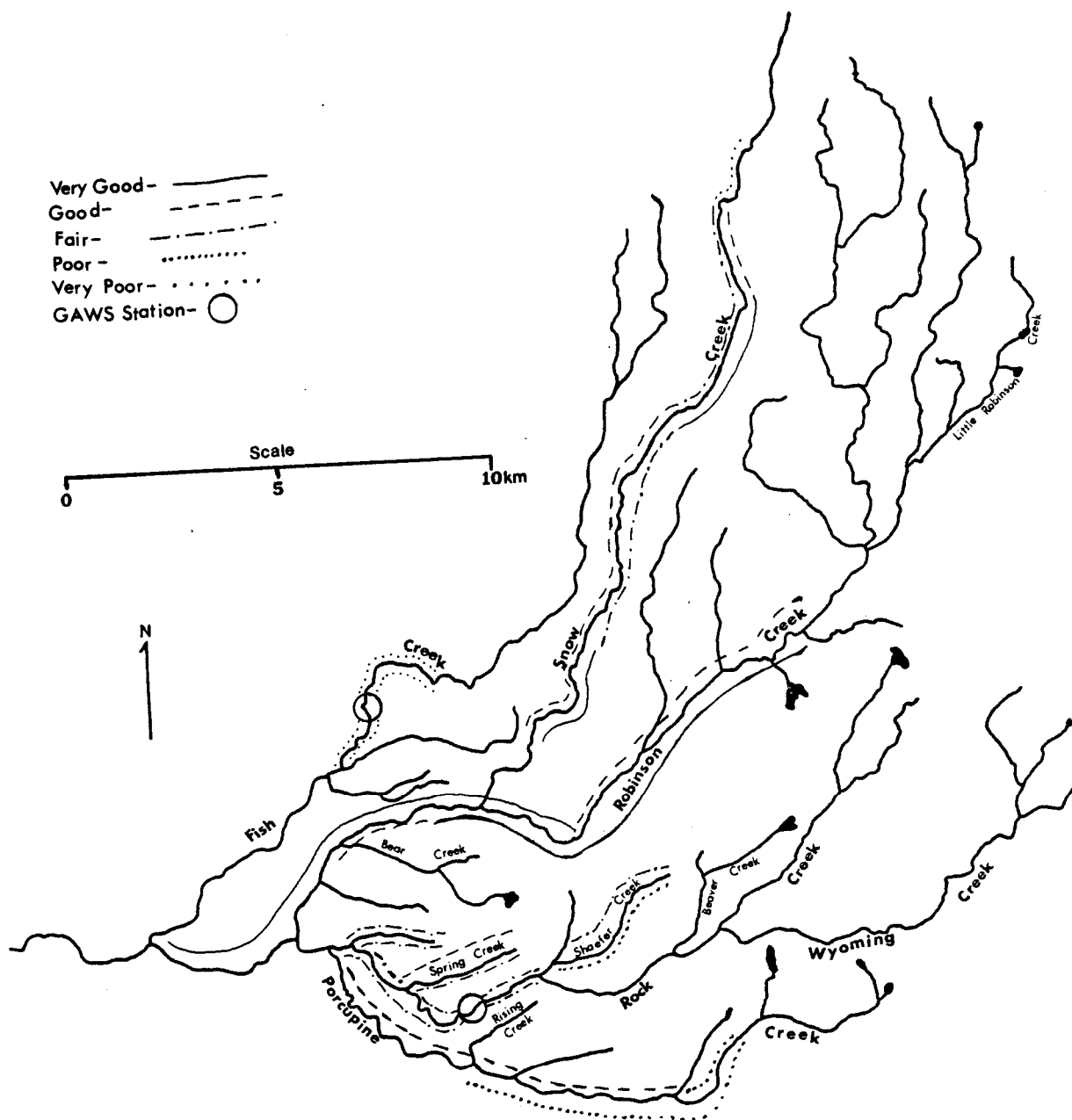


Figure 7. Assessment of pool habitat (north or west bank) and spawning habitat (south or east bank) quality and locations of GAWS transects on Robinson Creek and tributaries in Targhee National Forest. Data from Rainville (1978).

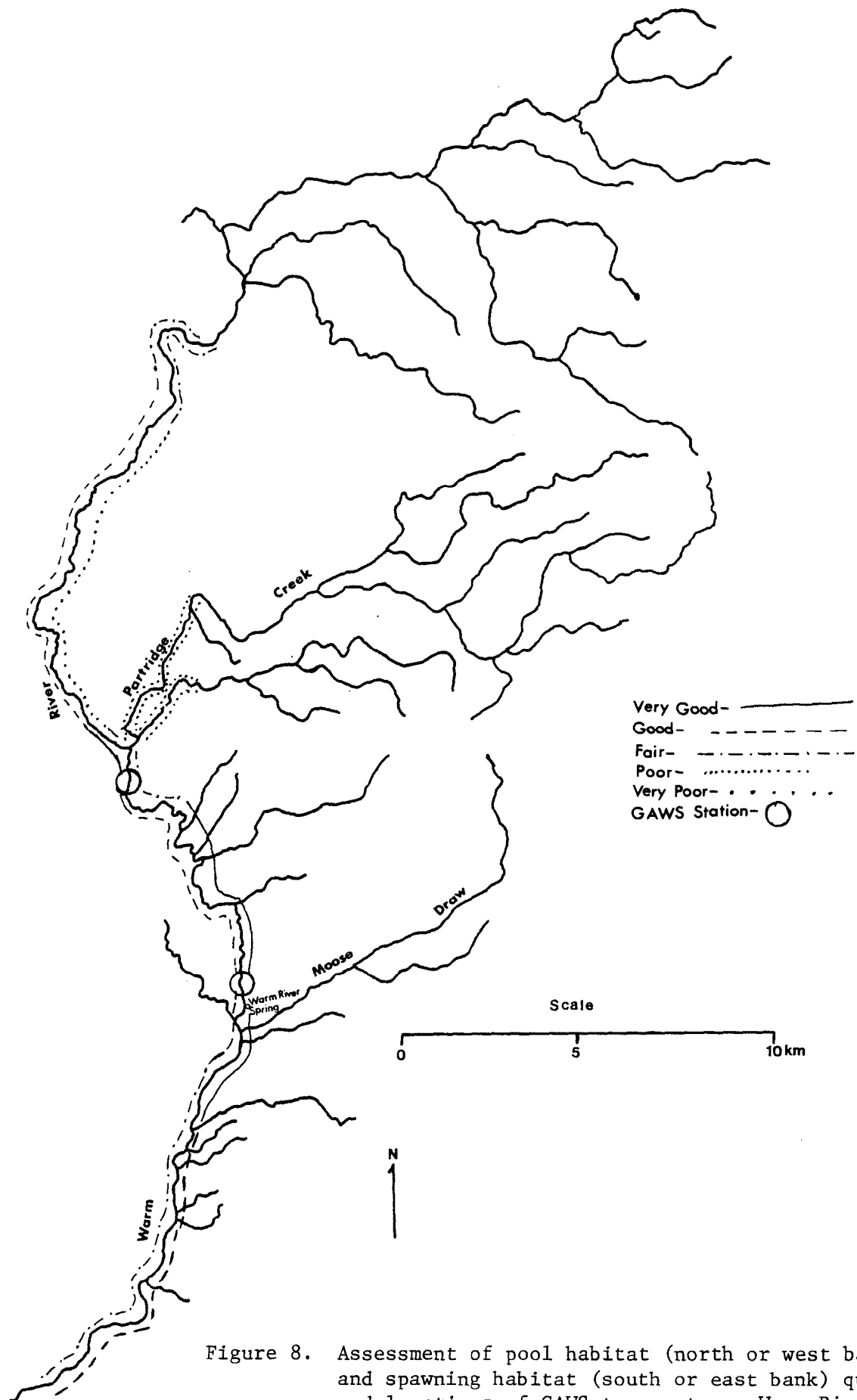


Figure 8. Assessment of pool habitat (north or west bank) and spawning habitat (south or east bank) quality and locations of GAWS transects on Warm River and tributaries in Targhee National Forest. Data from Rainville (1978).

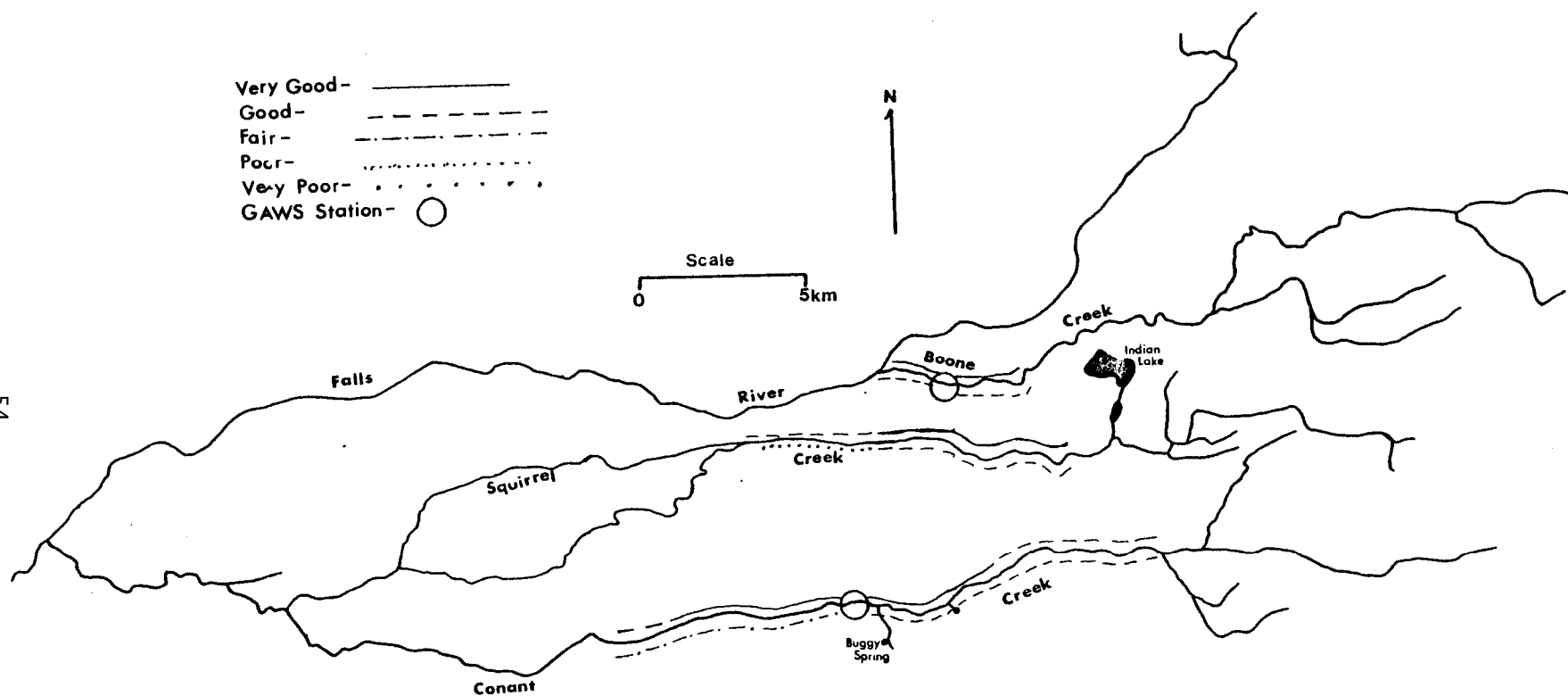


Figure 9. Assessment of pool habitat (north or west bank) and spawning habitat (south or east bank) quality and locations of GAWS transects on Falls River tributaries in Targhee National Forest. Data from Rainville (1978).

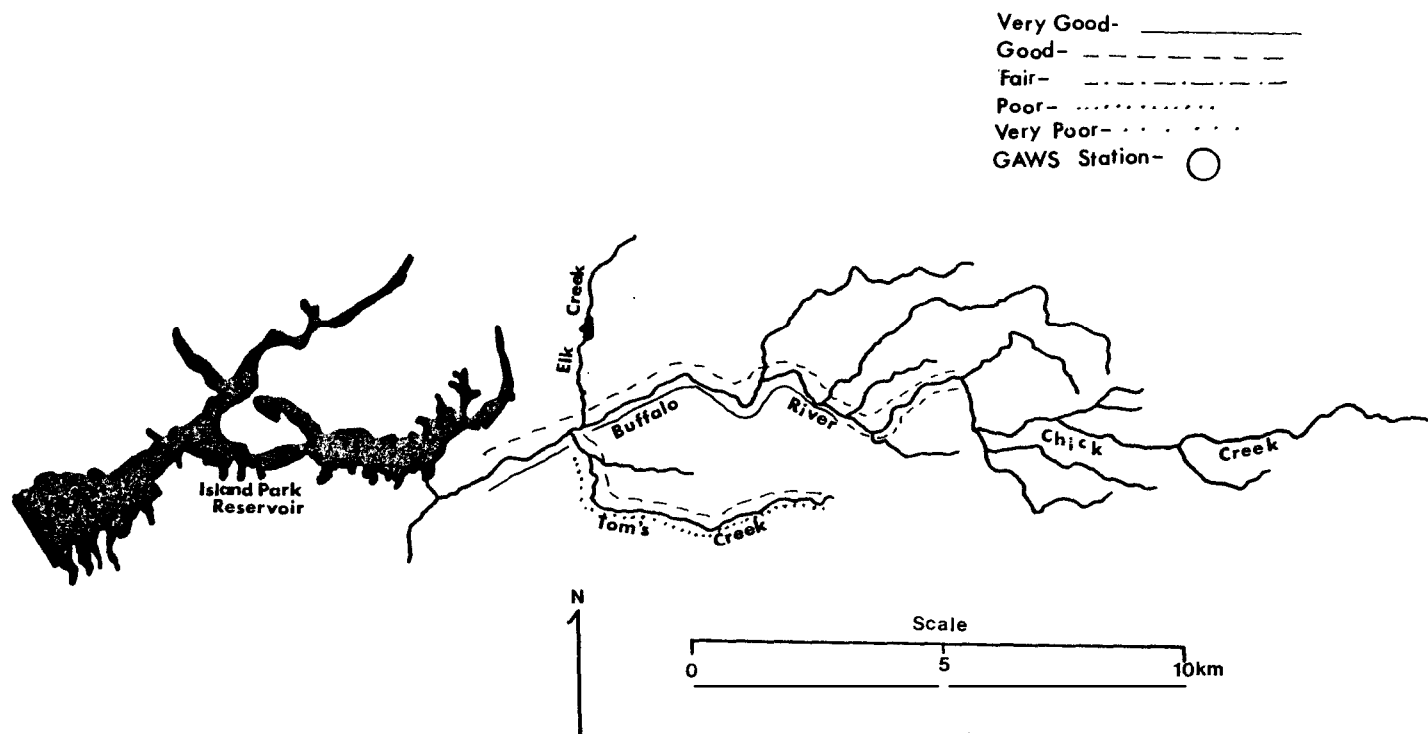


Figure 10. Assessment of pool habitat (north or west bank) and spawning habitat (south or east bank) quality and locations of GAWS transects on Buffalo River and tributaries in Targhee National Forest. Data from Rainville (1978).

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APPENDICES

Appendix A. Fin clips given to fish too small to tag in Henrys Fork tributaries, 1983.

System	Stream	Transect	Clip
Creek	Robinson Creek	Above Falls YNP	None
		Below Falls YNP	None
	Little Robinson Creek	Above Junction w/Robinson Creek YNP	None
		Headwaters	Ad
	Snow Creek	End of Road 527	LV
		Above Snow Creek Road culvert	None
		Below Snow Creek Road culvert	None
		Upstream from Last Crossing of Cave Falls Road	
	Wyoming Creek	End Road 247	LV
		Below Road 490	Ad
		Upstream from Road 124	Ad
		End of Road 576	LV
		Upstream from Cave Falls Road	LV
	Porcupine Creek	End Road 490	
		In Howell Ranch	LV
		Parallel to Cave Falls Road	Ad
Warm River	Rising Creek	Guard Station GAWS	RV
		Along Cave Falls Road	None
	Fish Creek	North Fork GAWS	Ad
		Near Stephens Fish Creek Ranch	LV
	Warm River	Headwaters below Scout Camp	None
		Above Junction with Partridge Creek	LV
		Pole Bridge Campground GAWS	Ad
		1 km below Pole Bridge Campground	UC
	Partridge Creek	CAWS Station above Warm River Spring	LV,RV,Ad
		At end of Road 499	None
	Moose Draw	At Junction with Warm River	None
		Junction with Warm River	None
Falls River	Boone Creek	Near Wyoming Border below Indian Lake	None
		CAWS Station at Road 042	None
	Conant Creek	GAWS Station near Buggy Springs	Ad
		Campsite below Buggy Springs	LV
		Below Road 263	LV

Appendix A. Continued.

System	Stream	Transect	clin
Fall River (Cont)	Squirrel Creek	At Henry Meadows Road Crossing at end of Road 580 Downstream from Bergman Ditch Diversion Below Road 263 Downstream from Squirrel Road	Ad None None LV
Buffalo River	Buffalo River Chick Creek	T13N R44E Section 20 Upstream from Road 291	Ad None

Appendix B. Summary of lengths, weights and condition of salmonids sampled by electrofishing from Henrys Fork tributaries, 1983.

			Mean	Mean	Mean K	Number of trout - total length (mm)														
Stream - transect	Date	Species	length (mm)	weight (gm)		<49	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-
<u>Robinson Creek</u>																				
Above Falls YNP	7/27	CTT	182	—	—				1	2	5	2	2							
Below Falls YNP	7/27	CTT	162	—	—			2	1	1	2			1						
<u>Little Robinson Creek</u>																				
Above junction w/ Robinson Cr YNP																				
Robinson Cr YNP	7/27	BRK	85	—	—	20	12	5	4	3	5	3	1	1						
		CTT	189	—	—					1	3	1	4	1						
<u>Snow Creek</u>																				
Headwaters	6/22	BRK	99	—	—	1	4	6	7	2		1								
Upstream from Rd. 527	6/22	BRK	87	—	—	3	1	14	2	1	2									
Above Snow Cr Rd. culvert	6/22	BRK	109	—	—			6	2	1	1	1								
		CTT	152	—	—						1									
Below Snow Cr Rd. culvert	6/22	BRK	119	—	—			2		1		1								
<u>Rock Creek</u>																				
Upstream from last crossing of Cave																				
Falls Rd.	7/8	BRK	140	35	1.3		2	4	3	14	14	2	2							
End of Rd 247	7/15	BRK	140	53	1.7	2	2	5	12	9	12	6	5							
		CTT	144	25	0.8					1										
Below Rd 490	7/12	BRK	157	63	1.5		5	7	75	87	31	59	41	16	6		1			
		WRB	226	160	1.4							1	1	1	1					
		HYB	225	142	1.3								1							
		CTT	220	—	—								1							
		MWF	260	—	—										2					

Appendix B. Continued.

Stream – transact	Date	Species	Mean	Mean	Mean	Number of trout – total length (mm)														
			length	weight		<49	50–	75–	100–	125–	150–	175–	200–	225–	250–	275–	300–	325–	350–	375
			mm	•m	K															
<u>Wyoming Creek</u>																				
Upstream from Rd. 124	7/8	CTT	174	57	1.1						1									
		BRN	189	101	1.5						4	8	2	2						
Downstream from Rd. 124	7/12	BRN	175	74	1.4					2	5	5	2							
		CTT	195	90	1.2						1									
End of Rd. 573	7/6	CTT	215	130	1.3								1							
End of Rd. 576	7/13	CTT	213	132	1.3							2	2		1	1				
		BRN	204	114	1.3								3							
<u>Beaver Creek</u>																				
Upstream from Cave Falls Rd.	7/8	BRK	97	24	1.3	17	1	12	13	7	2	4	2							
<u>Spring Creek</u>																				
End of Rd. 490	6/29	BRK	156				4	1			4	7	2	1						
<u>Porcupine Creek</u>																				
In Howell Ranch	6/29	BRK	164	71	1.4	2	4		3	17	26	15	11	1	4					
		BRN	118	32	2.0				1											
Parallel to Cave Falls Rd.	6/28	BRK	116	55	1.3	6	15	1	1	9	11	4	4							
Guard Station CAWS	6/30	BRK	153	65	1.4		9	4	7	16	29	18	9	2	1					
		WRB	155	43	1.2					1	1									
		BRN	289	338	1.4											2				

Appendix B. Continued.

* = =

Stream - transect	Date	Species	Mean Length [mm]	Mean weight [gm]	Mean K	Number of trout - total length [mm]														
						<4	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375
Rising Creek Along Cave Falls Rd.	6/28	BRK	93			4		3	2	1			1							
		BRN	137							5	1									
<u>Fish Creek</u> North Fork GAWS	6/22	BRK	105				29	19	14	21	7	2	1							
Near Stephens Fish Creek Ranch	6/23	BRK	160	49	1.2			1	18	12	31	35	5							
		CTT	126	71	1.2		1					1								
<u>Warm River</u> Headwaters below Scout Camp	8/4	BRK	BO			3	28	5	7	4	2	1								
Above junction with Partridge Cr	7/26 7/28	BRK	140	46	1.4		13		40	43	19	15	14	5	3					
		WRB	240	188	1.3							1	1	3		1				
		HRB	244	182	1.3								1	3	3					
		BRN	211	149	1.6								1							
Pole Bridge Camp- ground GAWS	7/26	BRK	121	30	1.3	1	5	11	18	4	2									
		WRB	217	130	1.2						1	4	7	5			1			
		HRB	202	97	1.2							9	14	2						
1 km below Pole Bridge Campground	8/29 8/31	BRK	102	61	1.4		24	10	3	11	6	2	1							
		WRB	229	155	1.3									1						
GAWS above warm R. Springs	7/28 7/29	BRK	138	57	1.5	1	8		5	27	17	2	6							
		WRB	164	87	1.6		1	3	10	10	10		9	4	2			1		
		HRB	217	116	1.1								3							
		BRN	155	55	1.4				1	8	5	2	1							
		MWF	363	412	1.4										1			1	2	4

Appendix B. Continued.

Stream –		Species	Mean length h	Mean weight iam)	Mean K	Number of trout – total length (mm)															
transact	date					<4	50–	75–	100–	125–	150–	175–	200–	225–	250–	275–	300–	325–	350–	375	
<u>Warm River (Con't)</u>																					
Warm River Camp-																					
ground	6/20	BRK	196	140	1.3				1				1		1						
		WRB	162	179	1.2			2	22	11	7	9	6	6	3	2	1				
		HRB	213	110	1.0							1	1	1							
		BRN	166	178	1.2		4		7	10	6	3	3	1	1						
		MWF	262										1	14	25	13	4				
<u>Partridge Creek</u>																					
End of Rd. 499	8/16	BRK	124	56	1.6	7	5	28	15	19	25	10	2	2							
At junction w/ Warm River	8/4	BRK	88			7	41	9	13	4	8	5									
<u>Moose Draw</u>																					
At Junction w/ Warm River																					
	8/31	BRK	117				3				2		1								
		WRB	91	36	1.8		10	10	3	1	1	1	1								
		HRB	189	83	1.2						2		1								
		BRN	71				2														
<u>Boone Creek</u>																					
Near Wyoming border below Indian Lake																					
	8/18	BRK	144	27	0.9					1											
GAWS Station at Rd. 042																					
	8/17	WRB	110	–	–			1													
		CTT	315	350	1.1																

Appendix B. Continued.

			Mean	Mean	Mean	Number of trout - total length (mm)														
Stream -			length	weight																
transact	Date	Species	(mm)	[gm]	K	<49	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375-
<u>Conant Creek</u>																				
GAWS Station near																				
Buggy Springs	8/5-11	BRK	155	137	1.3	2	8	2	6	8	5	7	7	4	4	1				
		WRB	172	189	1.7			7	7	4	2	1	5	1	1	1	1		2	1
		HYB	205	76	1.1						1	1	1							
		CTT	185	64	1.0							1								
		MWF	186	170	1.3		1		10	1	2	3	1	5	2	1			1	1
Campsite below Buggy Springs	8/10- 8/11	BRK	174	171	1.3	1		2	5	1	1	2	2	3	1	1	1			
		WRB	150	222	1.4		6	9	1		3	2	2		1		1			
		MWF	214	271	1.1				6	1	2			4	7	2	2			
<u>Boone Creek Con't</u>																				
Below Rd. 263	8/5	BRK	196	102	1.4							1								
		WRB	205	109	1.3							1	1							
		HRB	225	130	1.1									1						
		MWF	277					1	1								1	3	2	
At Henry Meadows																				
Road Crossing	6/19	BRK	183	126	1.6			1			2	3				1				
		WRB	233	206	1.6					2	1	2				1	1	1	1	
		MWF	203	235	1.2			1		1	1		1			2	1			
<u>Squirrel Creek</u>																				
At and of Rd.																				
580	8/12	BRK	144	95	1.4	1	12		6	5	6	7	10	1	1					
		CTT	161	94	1.6			1	5	1		3	1	1	2					

Appendix B. Continued.

-----"																				
			Mean	Mean	Mean	Number of trout - total length (mm)														
Stream -			length	weight		<49	50-	75-	100-	125-	150-	175-	200-	225-	250-	275-	300-	325-	350-	375
transact	Date	Species	[mm]	[gm]	K															
Downstream from																				
Bergman Ditch																				
Diversion	8/18	HRB	232	118	0.9									1						
		CTT	80					1												
Downstream from																				
Crossing Rd. 263																				
Downstream from	8/12	HRB	223										1	1						
Squirrel Rd.	8/18																			
	8/19	BRK	137	77	1.4		6	18	5	15	14	7	6	3	1	1				
		MWF	295	290	1.1											1				
<u>Buffalo River</u>																				
TI 3 N R44E																				
Section 20	9/2-13	BRK	121	107	1.4		14	61	14	25	12	11	10	1	2			1		
		WRB	114	99	1.4	3	32	24	16	14	16	9	7	1						
<u>Chick Creek</u>																				
Upstream from																				
Rd. 291	9/1	BRK	96	50	1.3		8	2	5	2	2									
		WRB	110	52	1.3		2	2	3		2									

¹Species abbreviations: BRK-Brook Trout, WM-Wild Rainbow, HRB-Hatchery Rainbow, HYB-Rainbow-Cutthroat Hybrids, CTT-Cutthroat Trout, BRN-Brown Trout, MWF-Mountain Whitefish

²k-factors computed from mean lengths and weights of fish for which weight was recorded.

Appendix C. Summary of snorkel count estimates of trout population abundance in Henrys Fork tributaries, 1983.

Stream – transect	Date	Visib. (m)	L (m)	Left Bank				Right Bank			Center Area				
				W (m)	Area (m ²)	f counts	Mean + CI ³	Area (m ²)	f counts	Mean + 95% CI	Total area (m ²)	Area counted (m ²)	f counts	Mean + 95% CI	N + 95% CI
<u>Robinson Creek</u>															
End Rd. 470	9/14	3	190	6	570	2	24±15	570	2	24+5	Total area covered by two divers				
Canyon–Run	9/14	2.5	63	14	220	3	14±5	220	3	16+3	439	315	6	12±1	17±1
Canyon–Pool	9/14	2.5	60	15	210	3	12±3	210	3	38±10	480	300	6	22±10	35±16
Three Rivers Ranch	10/6	2	165	20	495	3	15±9	495	3	8±5	2255	660	6	5+3	18±10
<u>Warm River</u>															
Above Cascade	8/3/82	3	155	15.3			141 ¹			110 ¹	Not counted				
	3/21	3	155	15.3		1	95		1	53	Included with bank counts				
	8/31	3	120	15.3	484	3	64±8	472	3	98±4	876	717	6	50±9	61±11
Below Cascade	8/30	2.5	81	22	210	3	0	274	4	12+4	1191	210	12	3+1	15+7
<u>Boone Creek</u>															
Near Wyoming border below Indian Lake	9/12	2	350	5	988	1	1	988	1	0	Total area covered by two divers				
<u>Buffalo River</u>															
Above Buffalo Campground	9/1	3	335	39	2010	2	280±0	2010	2	255+205	9157	2010	4	255+68	1159+308
Below US 20 Bridge by Pond's Lodge	9/1	2	265	50	1060	1	9	1060	1	1	1113	1060	4	14±6	150+60

¹8/3/82 means are summed means for 3 replicate counts in upper portion of transect and two replicate counts in lower portion of transect.

²8/3/82 population estimates do not include center area of transect.

Appendix C. Continued.

Stream – transect	Population Estimate				Species composition	Remarks
	Transac	#/km	#/ha	% >305 mm		
<u>Robinson Creek</u>						
End Rd. 470	49+7	255	425	10.2	57% BRN, 32% WRB, 11% BRK	No whitefish or suckers observed
Canyon–Run	47+9	746	534	36.1	57% WRB, 22% BRK, 21% BRN	Whitefish and suckers abundant
Canyon–Pool	85±29	1416	944	20.0	80% WRB, 13% BRK, 7% BRN	Whitefish and suckers abundant
Three Rivers Ranch	41±24	248	126	0	50% WRB, 25% BRK, 25% BRN	Whitefish and suckers abundant
<u>Warm River</u>						
Above Cascade	251 ²	1619 ²	1058 ²		98% WRB, 1% BRK, <1% BRN	Whitefish estimate 57
	148	955	624		96% WRB, 4% BRK	Whitefish estimate 41
	223	1866	1163	8.9	97% WRB, 3% BRK, <1% BRN	Whitefish estimate 213, suckers abundant
Below Cascade	27	380	161	18.6	100% WRB	Whitefish estimate 247, Utah sucker estimate 89
<u>Boone Creek</u>						
Near Wyoming border below Indian Lake	1	–	–	100	100% WRB	Only one fish seen
<u>Buffalo River</u>						
Above Buffalo Campground	1694	5057	1850	N.A.	100% BRK	Large schools of brook trout in deep pools
Below US 20 Bridge by Pond's Lodge	160	604	121	N.A.	75% RB, 25% BRK	

¹8/3/82 means are summed means for 3 replicate counts in upper portion of transect and two replicate counts in lower portion of transact.

²8/3/82 population estimates do not include center area of transect.

Appendix D. Summary of total catch, number of marked fish at large and Recaptures in Rock Creek below Rd. 490, 7/12-14/83.

Date -----	Total Catch (C)	Total marked fish Large [M]	Recaptures -- [B]	CxM
7/12	69	0	0	0
7/13	176	69	12	12075
7/14	220	233	62	51260
Totals			74	63335

Appendix E. Body-scale regressions for trout sampled by electrofishing
from Henrys Fork tributaries, 1983.

__Stream	-----Transect	Body-scale		
		# fish__	regression	r ²
	Brook Trout			
Little Robinson Cr	Above junction with Robinson Creek YNP	21	$Y = -11.2 + 4.66X$	0.82
Snow Creek	Headwaters above Snow Creek Butte Road	18	$Y = 8.3 + 3.8X$	0.90
	Upstream from Rd. 527	19	$Y = 34.4 + 2.7X$	0.91
	Above and below Snow Creek Rd. culvert	15	$Y = 3.0 + 4.2X$	0.85
Rock Creek	Above Cave Falls Rd.	23	$Y = 15.4 + 4.1X$	0.73
	Along Rd. 247	32	$Y = -11.7 + 5.0X$	0.83
	Below Rd. 490	35	$Y = 1.5 + 4.7X$	0.72
Beaver Creek	Above Cave Falls Rd.	25	$Y = 5.4 + 4.3X$	0.78
Porcupine Creek	In Howell Ranch	16	$Y = 59.9 + 3.1X$	0.73
	Guard Station GAWS	17	$Y = 1.8 + 4.4X$	0.87
Rising Creek	Along Cave Falls Road	9	$Y = -34.6 + 5.9X$	0.66
Fish Creek	North Fork GAWS	31	$Y = -1.0 + 4.3X$	0.85
	Near Stephens Fish Cr Ranch	38	$Y = 22.7 + 3.6X$	0.72
Warm River	Headwaters near Scout Camp	12	$Y = -1.6 + 4.0X$	0.97
	Above junction w/Partridge Creek	12	$Y = 39.3 + 3.7X$	0.82
	Pole Bridge campground	18	$Y = 70.2 + 2.1X$	0.48
	GAWS			
	1 km downstream from Pole Bridge campground	15	$Y = 2.1 + 4.2X$	0.91
Partridge Creek	GAWS Station above Warm River Springs	13	$Y = -21.3 + 5.2X$	0.77
	End Rd. 499	37	$Y = -6.8 + 4.9X$	0.75
	Above junction w/Warm River	10	$Y = -3.6 + 4.8X$	0.75
Conant Creek	GAWS Station near Buggy Springs	15	$Y = 19.4 + 3.9X$	0.84
	At Henry Meadows Rd crossing	6	$Y = 18.4 + 4.2X$	0.52
Squirrel Creek	Downstream from Squirrel Rd.	19	$Y = 17.3 + 4.0X$	0.88
Buffalo River	T13N R44E Section 20	13	$Y = 21.0 + 4.4X$	0.87
Chick Creek	Upstream from Rd. 291	10	$Y = -11.5 + 4.4X$	0.93

Appendix E. Continued.

Stream	Transact	# fish_	Body-scale regression -----	r ²
	Rainbow Trout	(Wild)		
Warm River	Above junction w/ Partridge Creek	5	Y=164+0.8X	0.35
	Pole Bridge Camp- ground CAWS	12	Y=90.0+1.52X	0.48
	CAWS Station above Warm River Springs	12	Y=-34.8+3.3X	0.86
Moose Draw	Above junction with Warm River	15	Y=3.11+2.3X	0.88
Conant Creek	CAWS Station near Buggy Springs	13	Y=11.5+2.7X	0.83
	At Henry Meadows Road crossing	E	Y=-36.0+3.0X	0.94
Buffalo River	T13N R44E Section 20	11	Y=18.6+2.4X	0.89
Chick Creek	Upstream from Rd. 291	6	Y=49.8+1.3X	0.67
	Cutthroat Trout			
Robinson Creek	Above impassable falls YNP	14	Y=18.7+3.5X	0.83
	Below impassable falls YNP	5	Y=45.0+2.9X	0.84
Little Robinson Cr	Above junction w/Robin- son Creek YNP	3	Y=-176.5+8.8X	0.99
Wyoming Creek	End Rd. 576	5	Y=150.5+0.7X	0.02
	Brown Trout			
Wyoming Creek	End Rd. 576	32	Y=54.8+1.5X	0.56
Rising Creek	Along Cave Falls Rd.	6	Y=129.5+0.1X	0.01
Warm River	CAWS Station above Warm River Springs	9	Y=39.7+1.6X	0.72

Appendix F. Age-class frequency and survival estimates of wild rainbow trout sampled by electrofishing from Henrys Fork tributaries in 1983.

Stream	Transect	Dates surveved	0+	I+	II+	III+	IV+	V+	Survival
Porcupine Creek	Guard Station GAWS	6/30		2					
Warm River	Above Junction w/Partridge Creek	7/26-28				4	3		
	Pole Bridge Campground GAWS	7/26			2	8	1		
	GAWS Station above Warm River Springs	7/28-29		32	9	5			0.40
Moose Draw	Above Junction w/Warm River	8/31	20	3	4				
Conant Creek	GAWS Station near Buggy Springs	8/5,10, 11		18	7	2	2		
	Campsite below Buggy Springs	8/10,11	1	8	6	1			0.35
	At Henry Meadows Rd. crossing	8/19		5	0	3	1		
Buffalo River	T13N R44E Section 20	9/2,13	43	21	7				0.40
Chick Creek	Upstream from Rd. 291	9/1	2	5	2				

Appendix G. Age-class frequency and survival estimates for brook trout sampled by electrofishing from Henrys Fork tributaries, 1983.

Stream	Transect	Dates surveyed	0+	I+	II+	III+	IV+	Survival
Little Robinson Cr Snow Creek	Above Junction with Robinson Cr YNP	7/27	29	13	8	1		0.33
	Headwaters upstream from Rd. 527	6/22	3	14	4	2		0.38
	Above Snow Creek Rd. culvert	6/22	0	7	4			0.57
	Below Snow Creek Rd. culvert	6/22		2	2			--
Rock Creek	Upstream from last crossing of Cave Falls Rd.	7/8		9	28	4		0.14
	End Rd. 247	7/15	4	27	22			--
	Below Rd. 490	7/13-15	4	181	106	37	2	0.22
Beaver Creek	Upstream from Cave Falls Rd.	7/8	18	31	11			0.35
Porcupine Creek	In Howell Ranch	6/29	6	46	27	4		0.29
	Parallel to Cave Falls Rd.	6/28	21	22	8			0.36
	Guard Station GAW	6/30	12	50	28	2		0.20
Rising Creek	Along Cave Falls Road	6/28	4	6	0	1		--
Fish Creek	North Fork GAWS	6/22	12	41	26	6		0.38
	Near Stephens Fish Creek Ranch	6/23		20	74	8		0.11
	Headwaters near Scout Camp	8/4	26	16	4	2		0.35
Warm River	Above Junction w/Partridge Creek	7/26-28	13	104	27	4		0.20
	Pole Bridge Campground GAWS	7/26	6	33	2			0.06
	1 km below Pole Bridge Campground	8/29-31	34	21	3			0.14
	GAWS Station above Warm River Springs	7/28-29	8	48	7			0.15
Partridge Creek	At end of Rd. 499	8/16	10	45	53	5		0.09
	Above Junction w/Partridge Creek	8/4	48	24	10	5		0.46
Moose Draw	Above Junction w/Partridge Creek	8/31	4	0	1	1		--
Boone Creek	Near Wyoming Border below Indian Lake GAWS Station	8/18		1				--
Conant Creek	Near Buggy Springs	8/5,10,11	6	26	7	7		0.52
	Campsite on Buggy Springs Rd.	8/10,11	1	9	4	4	1	0.48
	At Henry Meadows Rd. crossing	8/19	1	5	1			0.20
Squirrel Creek	Downstream from Squirrel Rd.	8/18,19	25	32	16	3		0.31
Buffalo River	T13N R44E Section 20	9/2,13	63	44	5	1		0.15
Chick Creek	Upstream from Rd. 291	9/1	11	6	3			0.50

Appendix H. Age-class breakdown of cutthroat trout sampled from Henrys Fork tributaries, 1983.

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System	Stream	Transect	Dates surveyed	0+	I+	II+	III+
	Robinson Creek	Above impassable Falls YNP	7/27		2	6	
		Below impassable Falls YNP	7/27		3	0	1
Robinson Creek	Little Robinson Creek	Above junction w/ Robinson Cr YNP	7/27		2	1	1
	Wyoming Creek	Upstream from Rd.	7/12			1	
		End Rd. 576	7/13			3	1
	Fish Creek	Near Stephens Fish Creek Ranch	6/23			1	

Falls River	Boone Creek	GAWS Station at Rd. 042	8/17				1
	Conant Creek	GAWS Station near Buggy Springs	8/5,10,11			1	

Appendix I. Age-class breakdown of rainbow-cutthroat hybrid trout sampled by electrofishing from Henrys Fork tributaries in 1983."

System	Stream	Transact	Dates		0+	I+	~II+	III+
			--surveyed					
Robinson Creek	Robinson Creek	Below impassable Falls YNP	7/27		1			
	Little Robinson Creek	Above junction with Robinson Creek YNP	7/27		4	2		
	Wyoming Creek	Downstream from Rd. 124	7/12		1			
		End Rd. 576	7/13			4		
	Porcupine Creek	Guard Station GAWS	6/30			1		

Falls River	Conant Creek	CAWS Station near Buggy Springs	8/5,10,11			1	2	

Appendix J. Age-class breakdown of brown trout sampled from Henrys Fork tributaries in 1983.

System---	Stream	Transect	Dates surveyed	0+	+	II+
Robinson Creek	Wyoming Creek	Upstream from Rd. 124	7/8		16	
		Downstream from Rd. 124	7/12		14	
	Porcupine Creek	End of Rd. 576	7/13		3	
		Howell Ranch	6/29		1	
		Guard Station GAWS	6/30			2
	Rising Creek	Along Cave Falls Rd.	6/28		6	

Warm River	Warm River	GAWS Station above Warm River Springs	7/28,29		17	
	Moose	Above junction w/	8/31	2		

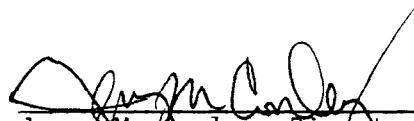
Submitted by:

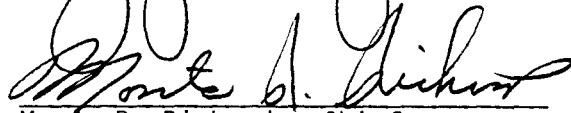
Robert Spateholts
Fishery Technician

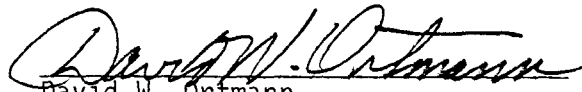
Virgil Moore
Regional Fishery Manager

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME


Jerry M. Conley, Director


Monte R. Richards, Chief
Bureau of Fisheries


David W. Ortmann
Fishery Research Supervisor